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ABSTRACT

This curriculum guide, the second part of a core curriculum for a rural agriculture program, consists of materials for use in presenting the final two units in a nine-unit course for high school vocational agriculture students living in rural areas. Addressed in the first unit are the following aspects of agricultural mechanics: selecting and using electric motors, adjusting and maintaining spraying equipment, and maintaining and servicing tractors. The second of the two units, a discussion of agricultural business management, deals with understanding and using basic economic principles of production, managing credit in agriculture, planning an insurance program, using the Illinois Farm Record Book, understanding agricultural taxes, using microcomputers in agricultural business management, understanding basic agricultural law, and planning an agricultural production business. Each of these two units contains some or all of the following: suggestions to the teacher, a teacher's guide, a competency inventory, information sheets, student worksheets or assignment sheets and a key, demonstrations, job sheets, transparencies, a discussion guide for the transparencies, and sample test questions along with a teacher's key. (MN)

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CORE IV MATERIALS
FOR RURAL
AGRICULTURE
PROGRAMS
UNITS H-I

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16. General Description:

This curriculum guide includes teaching packets for 24 problem areas selected as suggested areas of study to be included in a core curriculum for twelfth-grade or fourth-year students enrolled in a rural agriculture program.

17. Person Completing this Abstract: Earl B. Russell

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SUGGESTIONS FOR USING CORE MATERIALS

These instructional materials and teaching aids have been designed to improve instruction and increase student learning. Each problem area includes some or all of the following components.

1. Suggestions to the teacher
2. Teacher's guide
3. Competency inventory
4. Information sheets
5. Student worksheets or assignment sheets and key
6. Demonstrations
7. Job sheets
8. Transparencies
9. Discussion guide for transparencies
10. Sample test questions and teacher's key

This combination of instructional materials should be utilized as a source unit. This means that teachers should selectively choose those components and those parts which they need to achieve their teaching objectives. The project staff does not recommend that teachers "teach" the core program as it is presented. Instead, the teacher should personalize and localize the materials for the particular group taught and, wherever possible, add other materials and teaching techniques to enrich the core program.

Teachers could teach everything included in the core curriculum but this would not be advisable considering the variations which exist in vocational agriculture programs, students' needs and interests, and program objectives. Instead, teachers should select problem areas for a "local core" and supplement them with other problem areas important in the local area. Another suggestion is that the entire problem area need not be taught to a given group during a given year. For example, teachers may want to teach part of the parliamentary procedure problem area to a beginning class and teach the remaining part to an advanced class.

Specific suggestions for using the different components of a problem area packet are presented in the following section.

1. Suggestions to the teacher. These suggestions are included on the first page of each problem area. Teachers should read these suggestions before problem areas are scheduled for the year. Decisions need to be made regarding which problem areas will be taught, when they will be taught and the approximate number of days to be devoted to each problem area. On the basis of these decisions, teachers can construct a course calendar.

   In some cases, the suggestions also indicate the preplanning that needs to be accomplished before instruction begins. Instructional materials not included in the core need to be ordered in advance.

2. Teacher's guide. The teacher's guide is not a lesson plan. It is a source of teaching ideas which may be implemented by the agriculture teacher to conduct an effective instructional program. Each guide includes more material than most teachers would use. Teachers should select from the several interest approaches and teaching activities those suggestions which seem most appropriate for the local situation. The teacher's guide emphasizes a problem solving method and a student-centered, activity approach. Lecture-presentation, rote memorization of facts and subject matter mastery should be kept to a minimum. The teacher's guides include suggestions for carrying learning to the "doing" level. Application of classroom learning to S.O.E.P.'s and FFA activities is an important part of the teaching process.

3. Competency inventory. A listing of job competencies for most problem areas has been included in the Core IV materials. These listings are included to help teachers focus on skill development in the instructional program for advanced students. The competency inventories can be used to make students aware of the skills important on the job. By including them in the Core IV program, the developers intend to emphasize the importance of competency based instruction for students who are preparing for entry level employment.

4. Information sheet. These sheets have been prepared for those problem areas where subject matter may be difficult to locate. If reference materials are not available, the teacher may want to duplicate copies of the information sheets for class use.

5. Student worksheets or assignment sheets and keys. These exercises are designed as classroom activities for student use. They may provide a change of pace for students when they have grown tired of other activities which may be overused. Most exercises include a teacher's key with suggested answers.

6. Demonstrations. The teaching of certain problem areas often calls for demonstrations of manipulative skills or projects. The demonstration outline may be used by the teacher or students to conduct demonstrations of manipulative skills. Teachers may want to change some of the student activities included in the Teacher's Guide into student demonstrations.

7. Job sheets. In some problem areas, such as the agricultural mechanics areas, job sheets have been provided which include a step-by-step procedure for performing agricultural jobs. These sheets may be used

to guide students engaged in individualized learning and to take a load off the busy teacher who has a large class involved in a variety of learning activities.

8. Transparencies. Some of the problem areas include transparency masters which can be used to prepare overlays and others include small reproductions of transparencies developed for the Core Project which are available from Vocational Agriculture Service, University of Illinois.

9. Discussion guide for transparencies. Most of the transparencies included in the core materials do not include on the overlay any narration or explanation. The discussion guide provides teachers with some suggested points to bring out in the discussion of a transparency including explanations, descriptions and discussion questions related to the transparency.

10. Sample test questions and key. The sample test questions are not intended to be used as a test. The teacher can select questions from those included in the problem area if they are appropriate and add others as needed. Some teachers may choose not to administer a test at the close of each problem area and to prepare a comprehensive test at the end of a unit.

The numbering system found at the bottom of each page includes four digits or letters. The first number is a Roman numeral IV which stands for Core IV. The letters which run from A-I designate the unit. The third character is a numeral which indicates the problem area within the unit (1 means first, 2 for second, etc.). The last digit is the page number. All pages are numbered consecutively and the page in each problem area starts with "one."

The color scheme used in the Illinois Core Curriculum is as follows:

Salmon--Suggestions to the Teacher
Tan--Teacher's Guide
Light Blue--Information Sheets
Ivory--Student Worksheets
Pink--Job Sheets
Lime--Teacher's Key to Student Worksheets
White--Transparencies and Transparency Discussion Guides
Yellow--Sample Test Questions
Green--Teacher's Key to Sample Test Questions
Gold--Competency Inventories
Gray--Project Plans
Raspberry--Introductory Sheets

LIST OF UNITS AND PROBLEM AREAS
RURAL AGRICULTURE PROGRAM
CORE IV

UNIT A: Orientation to Agricultural Occupations

PROBLEM AREAS:

1. Exploring Educational Opportunities Beyond High School
2. Developing Employment Skills

UNIT B: Leadership and Citizenship

PROBLEM AREA:

1. Utilizing Local, State and Federal Agricultural Agencies and Resources

UNIT C: Supervised Occupational Experience

PROBLEM AREAS:

1. Developing S.O.E Programs for Non-traditional Students
2. Evaluating S.O.E. Programs and Setting Future Directions

UNIT D: Livestock Science

PROBLEM AREAS:

1. Developing Livestock Management Skills
2. Understanding and Using Artificial Insemination
3. Understanding Basic Genetics and Reproduction

UNIT E: Crop Science

PROBLEM AREAS:

1. Drying and Storing Grain
2. Growing Timber and Trees as an Agricultural Crop
3. Harvesting Forage Crops

UNIT F: Soil Science and Conservation of Natural Resources

PROBLEM AREA:

1. Utilizing Energy Effectively

UNIT G: Horticulture

PROBLEM AREA:

1. Establishing and Maintaining Turf

UNIT H: Agricultural Mechanics

PROBLEM AREAS:

1. Selecting and Using Electric Motors
2. Adjusting and Maintaining Spraying Equipment
3. Maintaining and Servicing Tractors

UNIT I: Agricultural Business Management

PROBLEM AREAS:

1. Understanding and Using Basic Economic Principles of Production
2. Managing Credit in Agriculture
3. Planning an Insurance Program
4. Using Illinois Farm Record Book
5. Understanding Agricultural Taxes
6. Using Microcomputers in Agricultural Business Management
7. Understanding Basic Agricultural Law
8. Planning an Agricultural Production Business

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Some of the material included in the Rural Core IV was written and/or reviewed by the following vocational agriculture instructors. The asterisk (*) identifies teachers who wrote selected problem area drafts.

1. Exploring Educational Opportunities Beyond High School

   Jim Guilinger
   Delmar Owens
   Al Tieken
   Clarence Benard
   Brian Cirks

2. Developing Employment Skills

   Jim Craft
   Al Tieken
   Kent Johnson

3. Utilizing Local, State and Federal Agricultural Agencies and Resources

   Jim Guilinger
   Reggie Grandt
   Richard Watson

4. Developing S.O.E. Programs for Non-traditional Students

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   Doug Schwartzkopf

5. Evaluating S.O.E. Programs and Setting Future Directions

   Charles Harn
   Reggie Grandt
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6. Developing Livestock Management Skills

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   Floyd Wohrley
   Jim Craft
   Steve Myers
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7. Understanding and Using Artificial Insemination

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8. Understanding Basic Genetics and Reproduction

Donald Miller
Paul Mealiff
Floyd Wohrley
Bill Bree
Steve Myers
*Kent Johnson
*Tom Faulkner

9. Drying and Storing Grain

Charles Harn
Eldon Chapman
Darrell Scherer
Donald Miller
*Richard Schertz

10. Utilizing Energy Effectively

Carl Burkybile
William Fortschneider

11. Establishing and Maintaining Turf

Robert Brown
Dick Petrowich
Al Tieken

12. Selecting and Using Electric Motors

Glenn Sims
Tom Faulkner
Eldon Chapman
Everett Moeller
Clarence Benard

13. Adjusting and Maintaining Spraying Equipment

John Bangert
Eldon Chapman
Tom Faulkner
Charles Ferguson
Dave Wilson
Dave Trent

14

14. Maintaining and Servicing Tractors

Darrell Scherer
Tom Faulkner
Donald Miller
Paul Mealiff
Frank Dry
Clarence Benard
Dave Wilson
*Allen Ritter

15. Understanding and Using Basic Economic Principles of Production

Everett Moeller
Glenn Sims
Donald Miller
C. Eugene McGrew
John Rentfrow
John Abell

16. Managing Credit in Agriculture

Donald Miller
Tom Hand
*David Erickson
Steve Launius
John Rentfrow

17. Planning an Insurance Program

Cedric Gowler
Mike Robertson
David Erickson
Mark Streit
Lee West

18. Using the Illinois Farm Record Book

Mike Robertson
Robert Brown
Reggie Grandt
Tom Hand
Charles Ferguson
Dave Wilson

19. Understanding Agricultural Taxes

Charles Harn
C. Eugene McGrew
Cedric Gowler
Tom Hand

20. Using Microcomputers in Agricultural Business Management

Chris Roegge
Frank Dry
Richard Schertz
Steve Myers
Dale Teel
James Huffman

21. Understanding Basic Agricultural Law

Cedric Gowler
Frank Dry
Al Tieken
C. Eugene McGrew
Clarence Tipton
John Rentfrow
*Dave Erickson

22. Planning an Agricultural Production Business

Clarence Tipton
Floyd Wohrley
Everett Moeller

16

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UNIT H: Agricultural Mechanics

PROBLEM AREAS:

1. Selecting and Using Electric Motors

2. Adjusting and Maintaining Spraying Equipment

3. Maintaining and Servicing Tractors

UNIT H: AGRICULTURAL MECHANICS

PROBLEM AREA: UNDERSTANDING AND USING ELECTRIC MOTORS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during the winter months when seasonal agriculture-related activities are at a minimum.

The estimated instructional time for this problem area is 7 to 10 days depending on how far the teacher wishes to go in developing student knowledge and skills in electric motors. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation. The Electric Motors Kit, available through Vocational Agriculture Service, should be scheduled for use during the time of the year you plan to teach this problem area.

CREDIT SOURCES:

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The teacher's guide, student worksheets, student job sheets, transparency discussion guide, and sample test questions were developed by Jerry Pepple, Department of Vocational and Technical Education, University of Illinois.

The artwork in this problem area was prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture teachers:

Glenn Sims - Windsor High School
Tom Faulkner - Union High School
Eldon Chapman - Herscher High School
Clarence Benard - Enfield High School
Everett Moeller - Beecher High School

TEACHER'S GUIDE

I. Unit: Agricultural mechanics

II. Problem area: Understanding and using electric motors

III. Objectives: At the close of this problem area students will be able to:

1. Identify the advantages of electric motors.
2. Select the proper type and size of electric motors for specific uses.
3. Explain how electric motors operate.
4. Demonstrate how to properly install electric motors.
5. Properly maintain and care for electric motors.
6. Diagnose electric motor problems and failures.
7. Test leads and be able to identify for proper wiring and operation.

IV. Suggested interest approaches:

1. Obtain several different types of electric motors and ask students to name them and give an example of where each could be used.
2. Ask students to name as many uses as they can think of in two minutes for electric motors. Give a small prize to the student with the most uses.
3. Promote class interest and discussion about electric motors by asking some of the following lead questions:
    a. Has anyone purchased an electric motor recently? If so, can you share the experience with the class? What was the motor used for? What size did you buy?
    b. Has anyone had an electric motor fail? What was the cause?
    c. How many electric motors are currently located and used in your homes?
    d. Why are electric motors so popular?
4. Distribute various retail catalogs and ask students to locate the types of electric motors offered for sale. Give a need for

a new motor and let them choose which one they would buy. Ask them to explain their choice.

V. Anticipated problems and concerns of students:

1. Why is it important to know about the different types of electric motors?
2. How can I tell the difference among the different types of electric motors?
3. What types of electric motors are commonly used around the home and farm?
4. What are the different parts of an electric motor?
5. How does an electric motor operate?
6. How do I determine which electric motor to purchase?
7. What are the advantages of electric motors?
8. How are electric motors tested for proper operation?
9. How do I properly wire an electric motor for operation?
10. How do I connect an electric motor to a power source?
11. How can I protect a motor from burning out due to an overload?
12. How do I reverse an electric motor?
13. How can I trouble-shoot an electric motor?
14. How should I properly clean electric motors?
15. What are some good practical maintenance procedures to use on electric motors?
16. How should electric motors be mounted?
17. What controls the speed of an electric motor?
18. What types of enclosures are available on electric motors?
19. Which is better, a flat belt or a V-belt drive system?
20. What can happen if an electric motor is overloaded?
21. What safety precautions should I observe when working on electric motors?
22. What are some terms commonly associated with electric motor care and operation?

VI. Suggested learning activities and experiences:

1. Begin the instructional phase of this problem area with the following steps:
    a. Select and conduct an interest approach.
    b. Assist students in the identification of goals and objectives.
    c. Have students identify their problems and concerns relating to using, installing and caring for electric motors. List these on the chalk board or overhead projector.
2. Add additional problems and concerns to the student list to adequately cover what is to be taught.
3. Reorder the problems and concerns so they are organized into a teachable sequence.
4. Select and distribute reference materials to students and conduct supervised study so students can answer problems and concerns.
5. Conduct discussion of problems and concerns. Supplement the student references with appropriate transparencies and filmstrips available from Vocational Agriculture Service.
6. Distribute VAS Unit 3058, "Selecting Electric Motors for Use in Agriculture" and Student Worksheet #1, "Selecting Electric Motors." Have students complete the worksheet and turn in for grading.
7. Using the VAS Electric Motors Kit, have students complete the Student Job Sheets included in this problem area. Set up the motors in work-stations and let students rotate until they have completed all the job sheets.
8. Conduct demonstrations on how AC and DC electric motors operate.
9. Distribute VAS Unit 3059, "Installing and Caring for Electric Motors in Agriculture," and Student Worksheet #2, "Maintaining Electric Motors." Have students complete the worksheet and turn in for grading.
10. Use selected VAS filmstrips to provide additional information on electric motor care.
11. Have students bring in used electric motors and let them clean, service, and recondition the motors for future use at home.
12. Distribute Student Worksheet #3, "Electric Motor Problems." Have students complete and turn in for grading.

13. Identify and define common terms associated with electric motors.

14. Have students organize and develop a display on electric motor safety and care as a community service activity.

15. Organize a community search to collect used, discarded electric motors and have students bring them in for reconditioning and sell them as an FFA money making activity.

VII. Application procedures:

1. Skills learned in selecting, using, and maintaining electric motors should be applied to the students' home situation.
2. Skills learned in this problem area should be used to supplement the students' S.O.E. activities.
3. Students should apply their knowledge about electric motors when working for agri-businesses.
4. Class members should be able to prepare and present a speech or demonstration on electric motor safety.

VIII. Evaluation:

1. Administer and evaluate suggested worksheets in this problem area.
2. Administer and evaluate skill tests on servicing electric motors.
3. Give a project grade on repair of students' motors.
4. Administer pencil and paper test on electric motors.

IX. References and aids:

Vocational Agriculture Service, University of Illinois, College of Agriculture, 1401 South Maryland Drive, Urbana, Illinois 61801:

1. VAS Unit 3058, Selecting Electric Motors for Use in Agriculture.
2. VAS Unit 3059, Installing and Caring for Electric Motors in Agriculture.
3. VAS Slidefilm 412A, "Magnetism and the DC Motor."
4. VAS Slidefilm 413A, "Induction and the AC Motor."
5. VAS Slidefilm 414A, "Testing, Connecting, and Reversing Electric Motors."
6. VAS Slidefilm 415A, "Trouble Shooting Electric Motors."

7. VAS Slidefilm 416, "Cleaning Electric Motors."
8. VAS Slidefilm 417, "Practical Maintenance of Electric Motors."
9. VAS Transparencies, "Electric Motors."
10. VAS Electric Motors Kit.

COMPETENCY INVENTORY

UNDERSTANDING AND USING ELECTRIC MOTORS

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

	Competency	Circle One						
1.	Start and stop electric motors properly to prevent damage.	1	2	3	4	5		
2.	Maintain electric motors.	1	2	3	4	5		
3.	Identify and select electric motors for specified uses.	1	2	3	4	5		
4.	Calculate electric motor pulley size and speeds.	1	2	3	4	5		
5.	Change direction of rotation of electric motors.	1	2	3	4	5		
6.	Check amperage draw under load.	1	2	3	4	5		
7.	Change electric motors from 120 volt to 240 volts or vice versa.	1	2	3	4	5		
8.	Repair electric motors.	1	2	3	4	5		
9.	Understand the principles of electromagnetism.						6	7
10.	Understand the principle of induction of electricity.						6	7

These competencies are outlined in the National Ag Occupations Competency Study, 1978, for entry level positions in agriculture.

Name ______________________ Date ____________

STUDENT WORKSHEET #1

SELECTING ELECTRIC MOTORS

(Refer to VAS Unit 3058)

1. Identify at least ten advantages of electric motors.

2. What factors should you consider when selecting an electric motor?

3. How does an electromagnet differ from a permanent magnet?

4. What factors control the amount of current which will be produced when a conductor cuts across the lines of magnetic force?

5. What are the two main parts of a typical induction motor?

6. What is slip? What causes it?

7. What methods are used to start induction motors and what are their characteristics?

8. What types of enclosures are commonly available for electric motors and under what conditions should each be used?

9. What types of bearings are commonly available on electric motors and when should each be used?

10. Where would you look to determine essential information regarding the characteristics of a specific electric motor?

STUDENT WORKSHEET #2

MAINTAINING ELECTRIC MOTORS

(Refer to VAS Unit 3059)

1. What requirements should be met when installing electric motors?

2. Which connections are most common today, V-belts or flat-belts? Why?

3. The number and type of V-belts to use are determined by what factors?

4. What is the "rule-of-thumb" for mounting distance between the motor and equipment?

5. Why is proper belt tension important?

6. How can variable speeds be obtained on machines?

7. What is the relationship between the speed and horsepower of an electric motor and machine.

8. What devices are required by the N.E.C. to protect and control electric motors?

9. What normal care should be given to electric motors?

10. How should motors be prepared for storage?

11. What factors can cause sudden failure of a motor?

12. What is meant by successful troubleshooting an electric motor?

STUDENT WORKSHEET #3

ELECTRIC MOTOR PROBLEMS

Some useful information:

a. One horsepower equals 33,000 foot pounds per minute.
b. One horsepower equals 550 foot pounds per second.
c. A foot pound equals the work done in lifting one pound one foot high.
d. One gallon of water weighs about eight pounds.

Solve the following problems.

1. How many horsepower would it take to pump water at a rate of 15 GPM from a well that is 70 feet deep?

2. How many horsepower would it take to operate a hoist so it will lift a load of 800 pounds at a rate of 5 feet in 15 seconds?

3. What size of pulley should be used on a motor to drive a machine at 647 RPM using a motor operating at 1725 RPM with an 8 inch pulley on the machine?

4. Use the "rule-of-thumb" to calculate the distance between the machine and motor for problem #3.

STUDENT JOB SHEET

STARTING TORQUE TESTS

Objective: To compare the starting torques of various electric motors under different load conditions.

Materials:

1. Split-phase motor
2. Capacitor-start motor
3. Repulsion-start motor
4. AC test set with voltmeter and ammeter
5. Torque test stand and scale

Procedures:

1. Set up test equipment.

2. Conduct and record no-load tests. Write the average ammeter and voltmeter readings for each motor on the chart below.

3. Make sure each motor is turning in the proper direction. Then attach the test pulley to the motor and the strap to scale.

4. Turn on the motor for just an instant. Record the voltmeter, ammeter, and scale readings on the chart below.

NO LOAD TEST	VOLTMETER	AMMETER	SCALE
a. Split-phase			XXX
b. Capacitor-start			XXX
c. Repulsion-start			XXX
LOCKED ROTOR TEST			
a. Split-phase			
b. Capacitor-start			
c. Repulsion-start			

5. Under what load conditions should each motor be used?

STUDENT JOB SHEET

OPERATING THE D.C. LABORATORY MOTOR

Objective: To understand how a D.C. motor operates.

Materials:

1. D.C. motor in VAS Electric Motors Kit
2. 6 volt battery
3. standard screw driver

Procedures:

1. Set up the motor for operation with permanent magnets for the field. What direction does the motor turn? ____________________
____

2. Reverse the magnets. What are the results? ____________________
____

3. Reverse the direction of current flow in the rotor. What are the results? ____________________
____

4. Substitute the electromagnet for the permanent bar magnets as the stator.

5. Hook the rotor and stator in parallel. What are the results and direction of rotation? ____________________
____
____

6. Reverse the leads on the dry cell 6 volt battery. Did the motor reverse? Why? ____________________
____
____

7. How can the motor be reversed? ____________________
____
____

   Try your idea and see if it works.

8. Hook the rotor and stator in series. What are the results and direction of rotation? ____________________
____
____

9. Reverse the leads on the dry cell battery. Did the motor reverse? Why? ____________________
____
____

10. How can the motor be reversed? ______________________________
____
____
____

Try your idea and see if it works.

11. Identify at least four principles of electric motor operation you learned by completing this exercise.

A.

B.

C.

D.

STUDENT JOB SHEET

OPERATING A SPLIT-PHASE MOTOR

Objective: To understand how to identify the lead wires and reverse a split-phase motor.

Materials:

1. Split-phase motor in VAS Motors Kit
2. Ohmmeter

Procedures:

1. Use an ohmmeter to identify the starting and running windings.
   a. Starting winding reading: ____________ ohms.
   b. Running winding reading: ____________ ohms.
2. Hook the starting and running windings in parallel.
3. Attach to AC power source and turn on.
4. Which way does the motor turn? ______________________________
5. Diagram the line in and motor windings as they are now hooked up. Label the diagram for the LINE, STARTING, WINDING AND RUNNING WINDING. The three dots below represent the binding posts.

   o

   o

   o

6. How can this motor be reversed? ______________________________
   ____
   ____

   Try your idea and see if it works.
7. Diagram the circuit as it is now.

   o

   o

   o

STUDENT JOB SHEET

OPERATING THE CAPACITOR START MOTOR

Objective: To understand how to identify the leads and reverse a capacitor-start motor.

Materials:

1. Capacitor start motor in VAS Motors Kit
2. Ohmmeter

Procedures:

1. Use an ohmmeter to identify the leads to the THERMOGARD, STARTING WINDING, RUNNING WINDING. Use tape to label for identification and record the information.

	Reading	Identification
a. Thermogard leads	______	______
b. Starting winding	______	______
c. Running winding	______	______

REMEMBER: Starting winding will read zero because the capacitor won't allow D.C. current to flow.
Thermogard reads the highest
Running winding reads the lowest.

2. What is the purpose of the thermogard? ______________________
____
____

3. How should the thermogard be wired in the circuit? __________
Why? ____
____
____

4. Attach the leads to the three posts on the terminal board BEFORE ATTACHING THE AC SOURCE. Check with the instructor. When given approval, proceed.

5. Attach to AC source.

Which way does the motor run? ______________________

6. Draw a diagram of the line in and the motor wires as they are now attached. The three dots below represent the three binding posts. Label the diagram for line in, overload protector, starting and running windings.

○

○

○

7. How can the motor be reversed? ______________________________

____

____

8. Try your solution to see if it works. (BE CAREFUL!! BEFORE ATTACHING AC LINE, DOUBLE CHECK THAT THE OVERLOAD PROTECTOR IS PROPERLY WIRED.)

9. Diagram the circuit as it now is, using the same symbols as above.

○

○

○

STUDENT JOB SHEET

OPERATING THE REPULSION START MOTOR

Objective: To understand how to connect and reverse a repulsion start motor.

Material:

Repulsion-start motor in VAS Motors Kit

Procedures:

1. Identify the two stator windings.
   a. How should these windings be hooked up for the motor to operate on low voltage? ____________________
   b. How should the windings be hooked for high voltage operation?
      ____
   c. Will your first trial at hooking the motor up for low voltage operation always be successful? ____________________
      Why? ____________________
      ____
      ____
      ____
2. Hook the motor up for low voltage operation. Were you successful with your first try? ________ Reverse the leads to ONE WINDING and observe the results.
3. Diagram the two situations and label one diagram "it runs when wired this way" and the other "it hums but doesn't run when wired this way."

o

o

o

o

o

o

STUDENT JOB SHEET

TROUBLE-SHOOTING A SPLIT-PHASE MOTOR

Objective: To understand how a split-phase motor operates

Materials:

1. Cut-away split-phase motor in VAS Motors Kit
2. Standard screwdriver

Procedures:

1. Plug in the split-phase motor. Which way does it run? __________

2. Observe the centrifical force-operated starting switch. Operate the mechanism manually. (CAREFUL! DON'T REACH INTO A RUNNING MOTOR.)

3. Place a piece of tape between the contacts of the switch to simulate trouble in the starting winding. Plug the motor in. Observe the results. ______________________________
____

   a. Give the motor a spin in one direction; plug it in. What What happens? ______________________________
   ____
   ____

   b. Stop the motor; spin in opposite direction. Observe results. What happens? ______________________________
   ____
   ____

4. Remove the cover plate on the junction box. How many wires are present on the terminals? __________

5. What do they represent? ______________________________

6. How would you reverse the motor? (Don't bother to reverse this one.)
____
____
____

7. Record the name plate information.

VOLTS__________ AMPS__________
PHASE__________ CYCLES__________
DEGREE C__________ H.P.__________

8. What directions are given for reversing the motor?
____
____
____

STUDENT JOB SHEET

TROUBLE-SHOOTING A CAPACITOR-START MOTOR

Objective: To understand how a capacitor start motor operates.

Materals:

1. Cut-Away capacitor-start motor in VAS Motors Kit
2. Standard screwdriver

Procedures:

1. Plug in the capacitor-start motor. Which way does it run? _______
2. Observe the centrifical force-operated starting switch. Operate the mechanism manually. (CAREFUL! DON'T REACH INTO A RUNNING MOTOR.)
3. Place a piece of tape between the contacts of the switch to simulate trouble in the starting winding. Plug the motor in. Observe the results. ____
   ____
   a. Give the motor a spin in one direction; plug it in. What happens?
      ____
      ____
      ____
   b. Stop the motor; spin it in the opposite direction. Observe results.
      ____
      ____
      ____
4. Remove the cover plate on the junction box. How many wires are present on the terminals? ____________
5. What do they represent? __________________________________
6. How would you reverse this motor? (Don't bother to reverse this one.)
   ____
   ____
   ____
7. Record the name plate information.

VOLTS________ AMPS________
PHASE________ CYCLES________
DEGREE C________ H.P.________

8. **What directions are given for reversing the motor?**

STUDENT JOB SHEET

TROUBLE-SHOOTING A REPULSION START MOTOR

Objective: To understand how a repulsion start motor operates

Materials:

1. Cut-away repulsion start motor in VAS Motors Kit
2. Standard screwdriver

Procedures:

1. PLUG IN THE REPULSION-START MOTOR.
   a. Which way does it run? ________________
   b. How can it be reversed?
   c. Try your suggested solution.
2. Carefully pull a brush spring aside, and lift a brush to simulate a burned out or broken brush; plug the motor in; what difference is noted?

   ____
   ____
   ____
   ____
3. Replace the brush to normal position.
4. Observe the starting switch mechanism. Plug the motor in and observe its operation. What does the mechanism do when it is actuated by centrifical force?

   ____
   ____
5. Copy the name plate information.

   H.P.__________ CYCLES__________
   RPM__________ PHASE__________
   VOLTS__________ __________
   AMPS__________ __________
6. How many amperes does the motor use at 115 volts?__________
   At 230 volts?__________
7. Multiply volts x amps in each of the situations above. What are the results?

8. Observe the stator windings. Is there a starting winding?

____

9. Note the rotor (look from both ends). How does it differ from a "squirrel cage" rotor?____

____

____

____

10. Note the wiring directions for high and low voltage on the name plate. Record your observations.

11. Can you, from this information, pair the wires so that you have two groups that represent the two windings?
Winding #1___________________
Winding #2___________________

TEACHER'S KEY

STUDENT WORKSHEET #1

SELECTING ELECTRIC MOTORS

(Refer to VAS Unit 3058)

1. Identify at least ten advantages of electric motors.

    A. Low initial investment
    B. Inexpensive to operate
    C. Efficient form of power
    D. Simple to operate
    E. Little servicing required
    F. Operate quietly
    G. Compact in size
    H. Ready to operate
    I. Will start a reasonable load
    J. Will tolerate a temporary overload
    K. Automatically controlled
    L. Long life
    M. Remotely controlled
    N. Adaptable
    O. Portable
    P. Safe to operate

2. What factors should you consider when selecting an electric motor?

    A. Type of electric power available, such as AC, DC, single phase, three phase.
    B. Size of motor, horsepower rating.
    C. Starting loads, running loads.
    D. Speed requirements.

E. Types of bearing requirements.

F. Type of mounting and position.

G. Operating environment of motor.

H. Efficiency index of motor.

3. How does an electromagnet differ from a permanent magnet?

   A. The electromagnet may be much stronger than the permanent magnet.

   B. The electromagnet has magnetism only while current is flowing through the coil.

   C. The poles of the electromagnet reverse when the direction of current flow in the coil is reversed.

4. What factors control the amount of current which will be produced when a conductor cuts across the lines of magnetic force?

   A. The strength of the magnetic field.

   B. The number of turns of wire in the coil.

   C. The speed at which the conductor cuts through the magnetic lines of force.

5. What are the two main parts of a typical induction motor?

   A stationary part called a stator and a rotating part called a rotor.

6. What is slip? What causes it?

   The difference between the actual and synchronous speed of an induction motor. The faster the speed the fewer lines of force are cut by the rotor. The actual speed is 4% to 5% less than the synchronous speed.

7. What methods are used to start induction motors and what are their characteristics?

   A. Shaded-pole, low starting torque.

   B. Split-phase, more starting torque than shaded-pole motors.

   C. Capacitor-start, about three times the starting torque of a split-phase.

   D. Permanent-split capacitor, much lower starting torque than capacitor-start.

   E. Repulsion-start induction, high starting torque.

   F. Universal, high starting torque.

   G. Three-phase, high starting torque.

   H. Synchronous, low-starting torque.

   I. Soft-start, low starting torque.

8. What types of enclosures are commonly available for electric motors and under what conditions should each be used?

   A. Open, indoors in clean, dry conditions.

   B. Splashproof, indoors and outdoors in mild conditions.

   C. Totally enclosed, extremely dirty conditions, and hostile environments.

   D. Explosion-proof, around gasoline and other explosive vapors in the environment.

9. What types of bearings are commonly available on electric motors and when should each be used?

   A. Sleeve bearings, horizontal mountings.

   B. Ball or roller bearings, vertical and incline mountings.

10. Where would you look to determine essential information regarding the characteristics of a specific electric motor?

    On the motor nameplate.

TEACHER'S KEY

STUDENT WORKSHEET #2

MAINTAINING ELECTRIC MOTORS

(Refer to VAS Unit 3059)

1. What requirements should be met when installing electric motors?

   All provisions of the National Electrical Code and any other local codes which may be more restrictive.

2. Which connections are most common today, V-belts or flat-belts? Why?

   V-belts, because a good grip is achieved with less belt tension. They stay on better without precision alignment, and permit lighter and more compact arrangement of motor and equipment.

3. The number and type of V-belts to use are determined by what factors?

   A. Speed and horsepower of the motor.

   B. Size of the motor pulley.

4. What is the "rule-of-thumb" for mounting distance between the motor and equipment?

   The distance between shaft centers should not be more than three times the sum of the pulley diameters, nor less than the diameter of the larger pulley.

5. Why is proper belt tension important?

   If belts are too loose they will slip and can over-heat and wear or jump off the pulleys. A belt that is too tight will overload the bearings.

6. How can variable speeds be obtained on machines?

   A. Using multi-step pulleys.

   B. Using split pulleys with adjustable walls.

7. What is the relationship between the speed and horsepower of an electric motor and machine.

   Doubling the speed of the machine may more than double the horsepower requirements of the motor.

8. What devices are required by the N.E.C. to protect and control electric motors?

   A. Disconnecting means.

   B. Motor branch-circuit overcurrent protection device.

   C. Motor controlling device.

   D. Motor-running overcurrent device.

9. What normal care should be given to electric motors?

   Cleaning, lubrication, storing, and on some types, maintaining the commutator and brushes.

10. How should motors be prepared for storage?

    A. Clean off all dirt and grease.

    B. Lubricate the bearings.

    C. Coat the shaft with grease.

    D. Wrap the motor to protect it from dirt, dust, and moisture.

11. What factors can cause sudden failure of a motor?

    A. Failure of power supply.

    B. Excessive load.

    C. Worn bearings.

    D. Operation of thermal protector.

    E. Operation of ground-fault protector.

    F. Failure of starting mechanism.

    G. Failure of motor windings.

12. What is meant by successful troubleshooting an electric motor?

    Looking for and eliminating the simplest difficulties first.

TEACHER'S KEY

STUDENT WORKSHEET #3

ELECTRIC MOTOR PROBLEMS

Some useful information:

a. One horsepower equals 33,000 foot pounds per minute.
b. One horsepower equals 550 foot pounds per second.
c. A foot pound equals the work done in lifting one pound one foot high.
d. One gallon of water weighs about eight pounds.

Solve the following problems.

1. How many horsepower would it take to pump water at a rate of 15 GPM from a well that is 70 feet deep?

   15 GPM x 8 lbs. = 120

   120 x 70 feet = 8400

   $\frac{8400}{33000}$ = .25 or 1/4 to 1/3 H.P. motor

2. How many horsepower would it take to operate a hoist so it will lift a load of 800 pounds at a rate of 5 feet in 15 seconds?

   800 x .33 feet/sec. = 264

   $\frac{264}{550}$ = .48 or about ½ H.P. motor

3. What size of pulley should be used on a motor to drive a machine at 647 RPM using a motor operating at 1725 RPM with an 8 inch pulley on the machine?

   647 x 8 = ? x 1725

   5176 = ? x 1725

   $\frac{5176}{1725}$ = motor pulley diameter

   3 inches = motor pulley diameter

4. Use the "rule-of-thumb" to calculate the distance between the machine and motor for problem #3.

   It should be no more than (8 + 3) x 3 = 33 inches or less than 8 inches.

ADVANTAGES OF ELECTRIC MOTORS

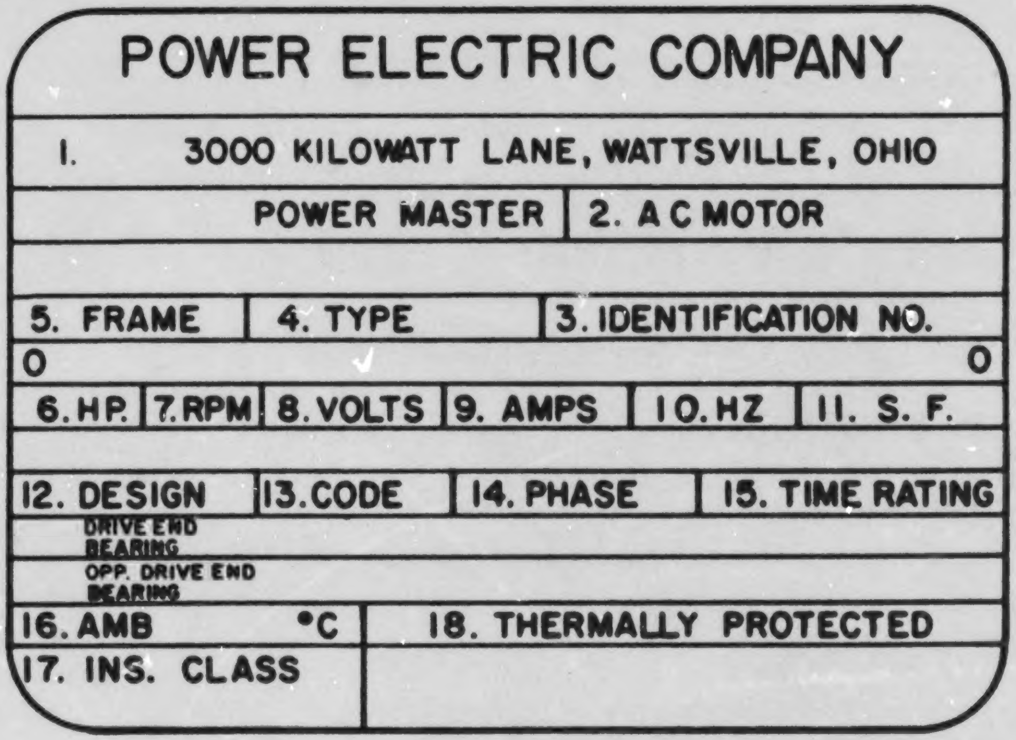
- Long life
- Low first cost
- Inexpensive to operate
- Simple operation
- Minimum servicing
- Adaptable
- Portable
- Efficient
- Safe
- Compact
- Quiet
- Ready to operate
- Start reasonable load
- Stand temporary overload
- Automatic control
- Remote control

SELECTING ELECTRIC MOTORS

Type of Power Available
Size of Motor
Starting Load
Speed Requirement
Type of Bearings
Type of Mounting
Environment

MODERN ELECTRIC MOTORS NAMEPLATE

1. Manufacturer
2. Alternating Current
3. Identification Number
4. Type of Motor
5. Frame Designation
6. Horsepower
7. Speed
8. Voltage
9. Amperes
10. Frequency
11. Service Factor
12. NEMA Design
13. Code
14. Phase
15. Time Rating
16. °C-Temperature Rating
17. Insulation Class
18. Thermally Protected



POWER ELECTRIC COMPANY

1. 3000 KILOWATT LANE, WATTSVILLE, OHIO

POWER MASTER | 2. A C MOTOR

5. FRAME | 4. TYPE | 3. IDENTIFICATION NO.

6. H.P. | 7. RPM | 8. VOLTS | 9. AMPS | 10. HZ | 11. S. F.

12. DESIGN | 13. CODE | 14. PHASE | 15. TIME RATING

DRIVE END BEARING

OPP. DRIVE END BEARING

16. AMB °C | 18. THERMALLY PROTECTED

17. INS. CLASS

CHARACTERISTICS OF SPLIT - PHASE MOTORS

Easy Starting Loads

Develops 150 % Full-Load Torque

High Starting Current (5- 7x full load current)

Sizes: 1/20 hp. — 1/2 hp.

Nearly Constant Speed

Single Voltage

Inexpensive

Simple Construction
    Squirrel Cage Rotor
    Auxiliary (Starting) Winding
    Starting Switch
    Running Winding

Change Direction — Reverse Winding Leads

Uses: Fans, Loads that increase as Speed increases

IV-H-1-38

CHARACTERISTICS OF CAPACITOR - START MOTORS

Difficult Starting Loads

Develops 350 - 400 % Full Load Torque

Medium Starting Current (3-6x full load current)

Sizes: 1/8 to 10 hp.

Nearly Constant Speed

Single or Dual Voltage (115 / 230 v.)

Simple Construction

- Squirrel Cage Rotor
- Auxiliary (Starting) Winding with Capacitor
- Starting Switch
- Running Winding

Change Direction — Reverse Winding Leads

Uses: Compressors, Grain augers, Pumps

CHARACTERISTICS OF REPULSION - START MOTORS

Very Hard Starting Loads

Develops 350 - 400 % Full Load Torque

Low Starting Current (2-4x full load current)

Sizes : 1/6 hp. — 10 hp.

Nearly Constant Speed

Usually Dual Voltage

Construction

- 2 Stator Windings
- Wound Rotor
- Brushes
- Brush - Lifting - Short Circuiting Mechanism

Change Direction — Move Brush Ring

Uses: Deep Well Pumps, Conveyors

CHARACTERISTICS OF UNIVERSAL MOTORS

Hard Starting Loads.

Develops 350 - 450 % Full Load Torque

High Starting Current

Sizes: 1/150 hp — 2hp.

Speed Changes with Load Variations

AC or DC Current

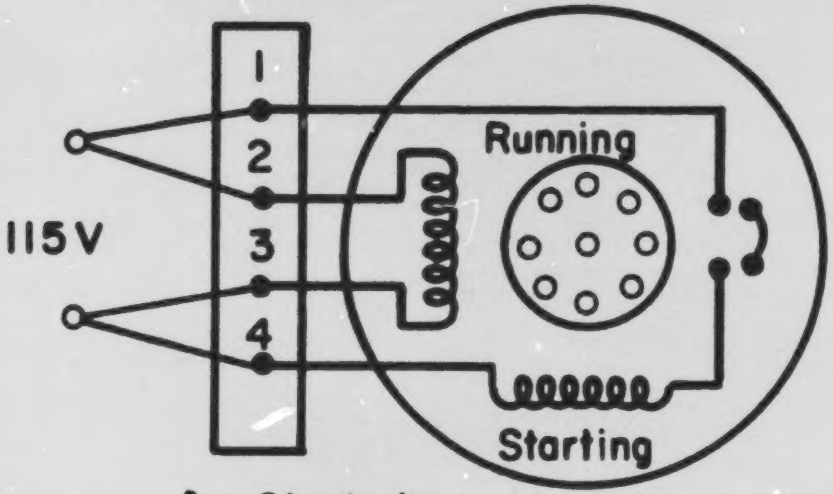
Construction

- Rotor in series with Stator
- Directly Connected to Load

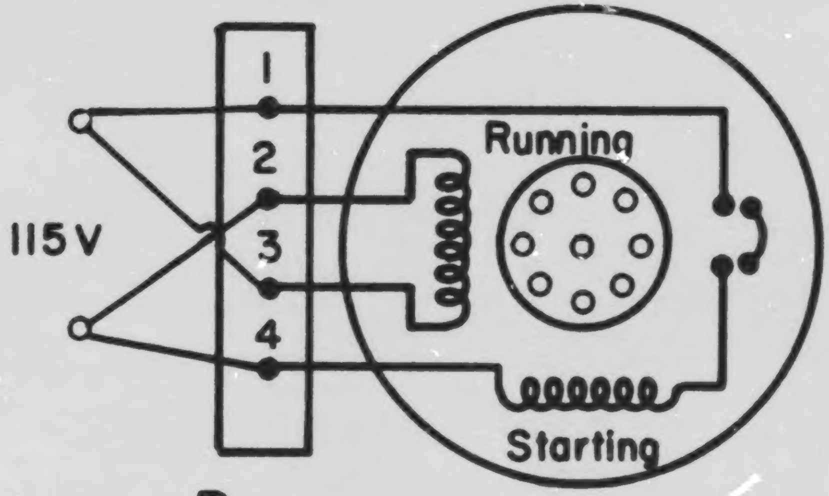
Some Types Electrically Reversible

Uses: Portable Tools, Kitchen Appliances

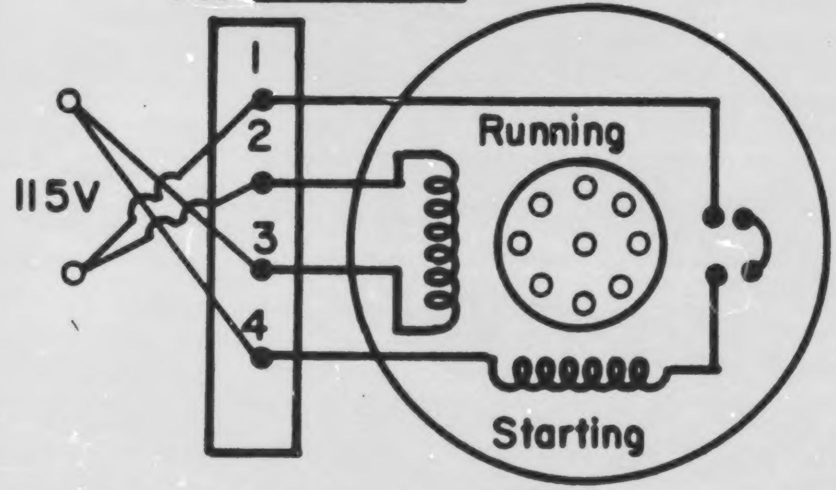
CONNECTING SPLIT-PHASE MOTOR


115V
1
2
3
4
Running
Starting

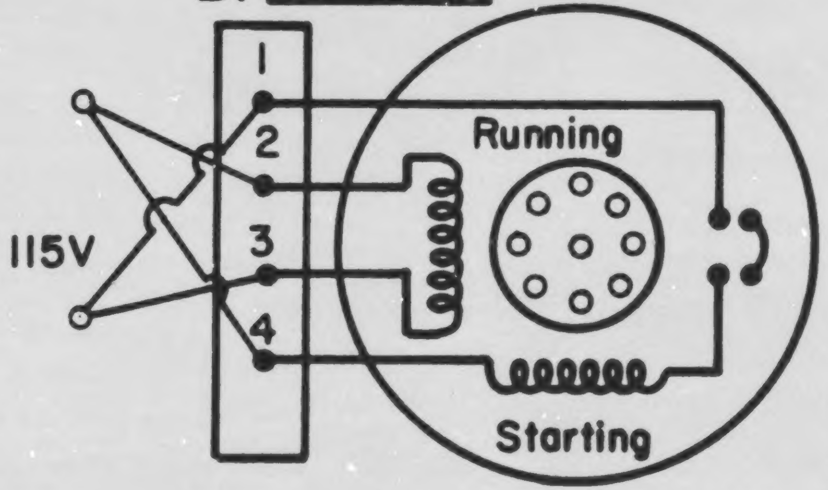
A. Clockwise


115V
1
2
3
4
Running
Starting

B. ________


115V
1
2
3
4
Running
Starting

C. ________

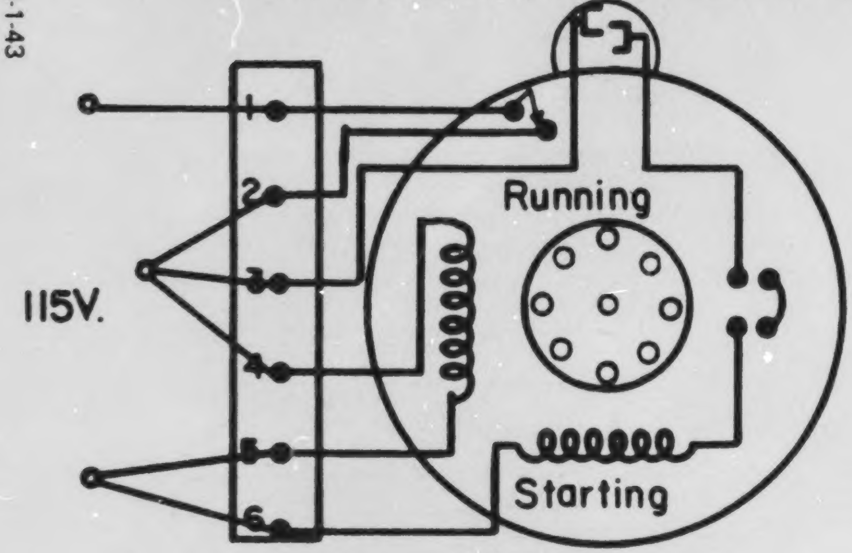

115V
1
2
3
4
Running
Starting

D. ________

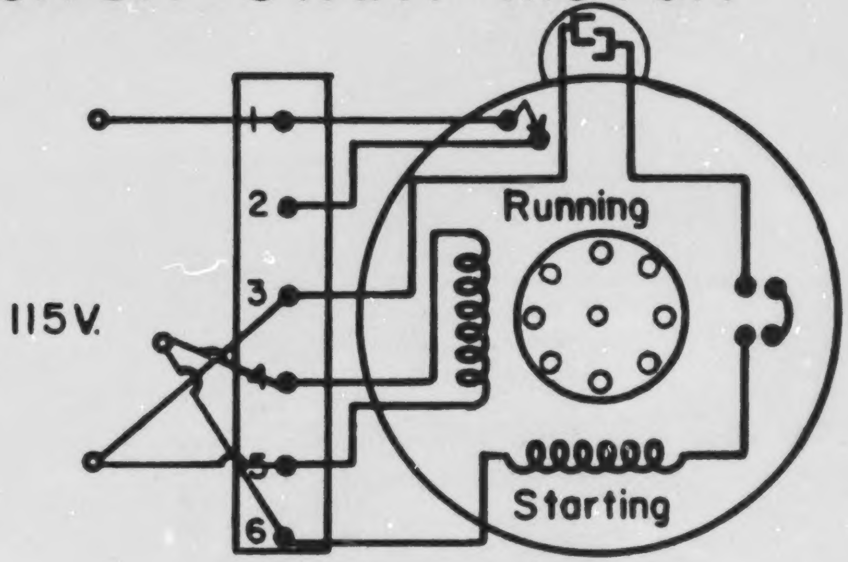
IV-H-1-42

IV-H-1-43

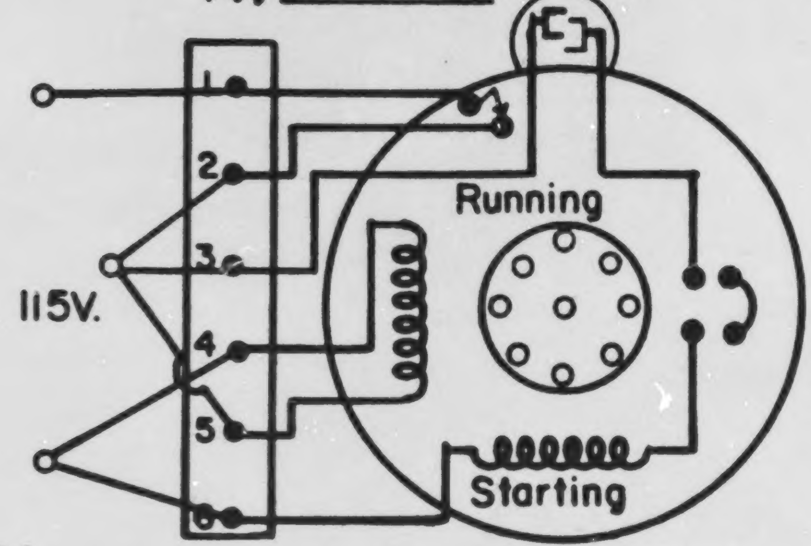
CONNECTING CAPACITOR- START MOTOR


1
2
3
4
5
6
115V.
Running
Starting

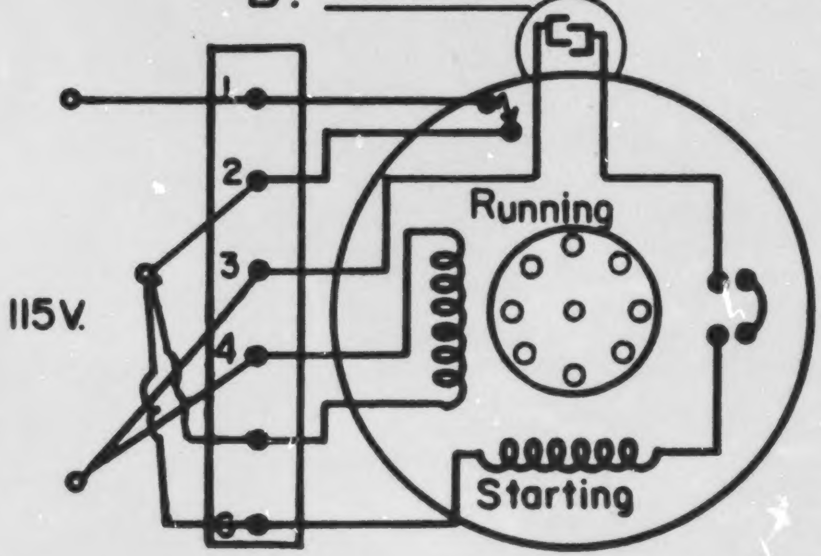
A. Clockwise


1
2
3
4
5
6
115V.
Running
Starting

B. ________

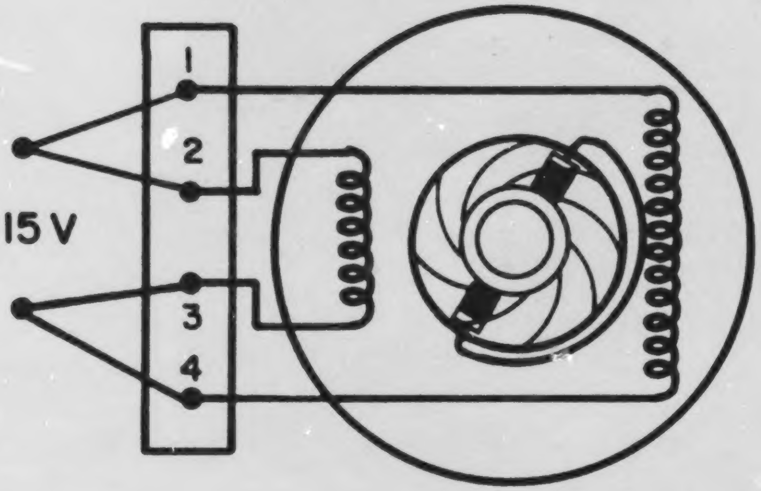

1
2
3
4
5
6
115V.
Running
Starting

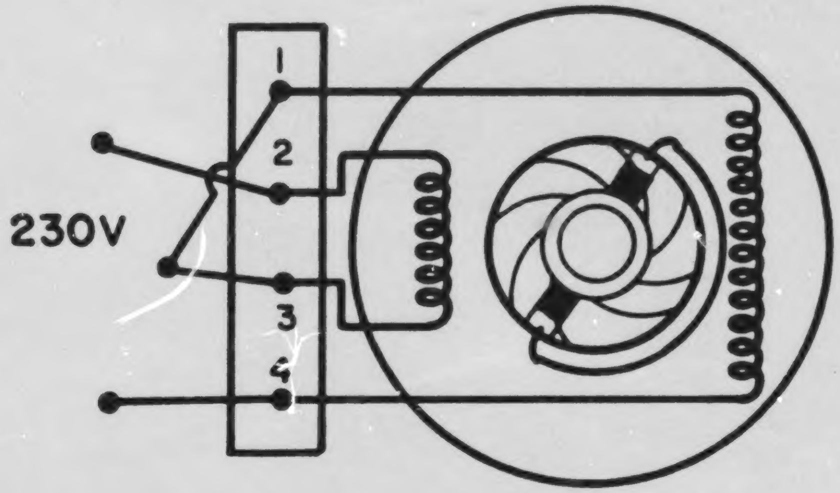
C. ________


1
2
3
4
6
115V.
Running
Starting

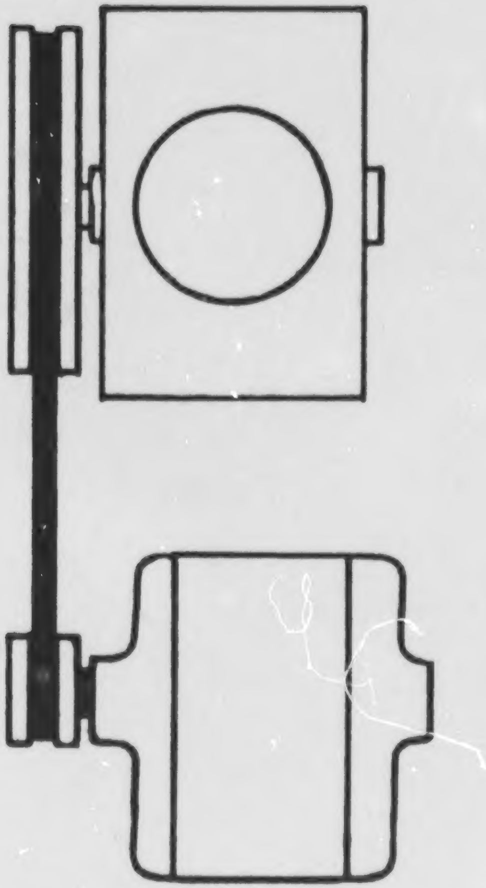
D. ________

CONNECTING REPULSION- START MOTOR

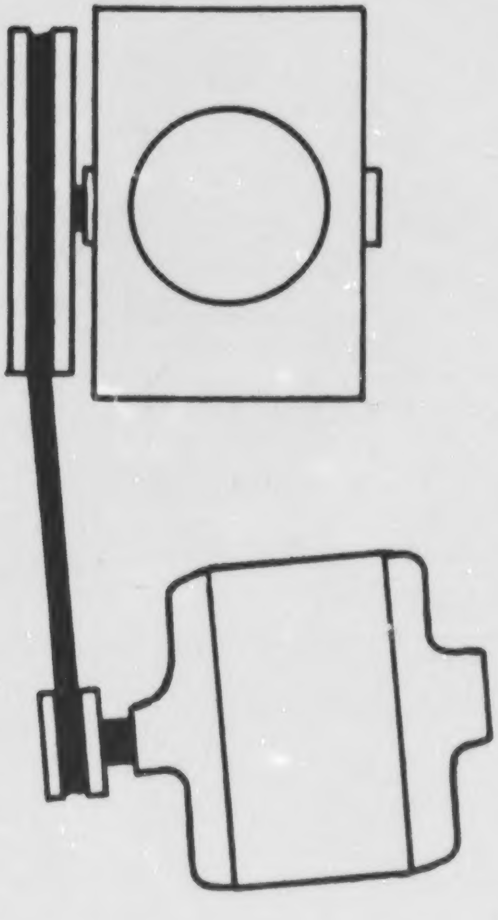




BELT ALIGNMENT

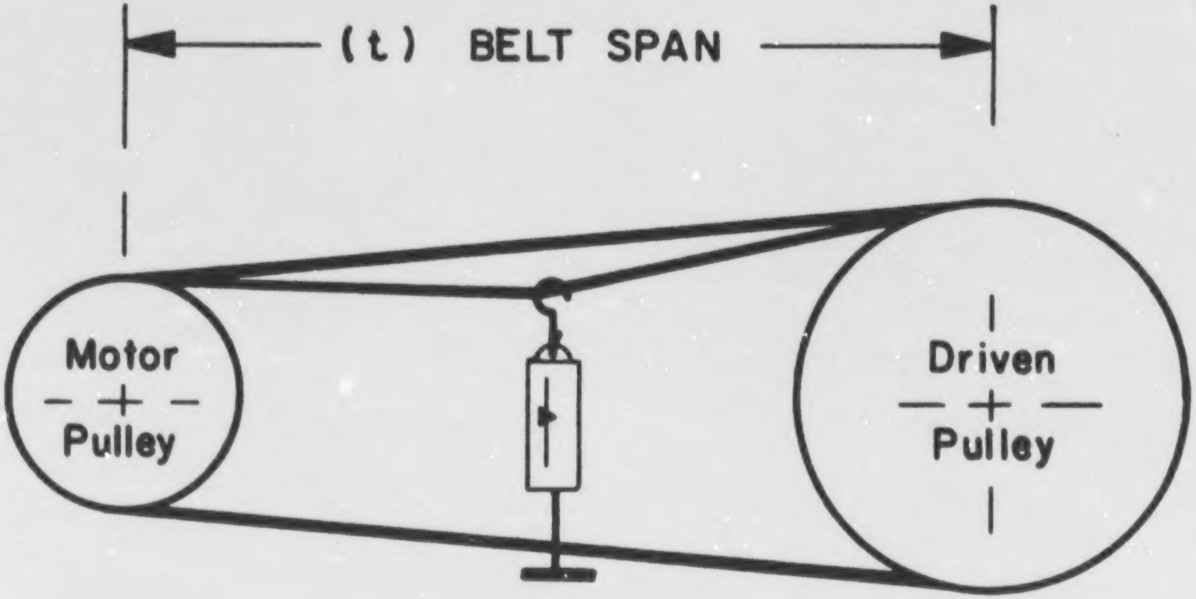


68



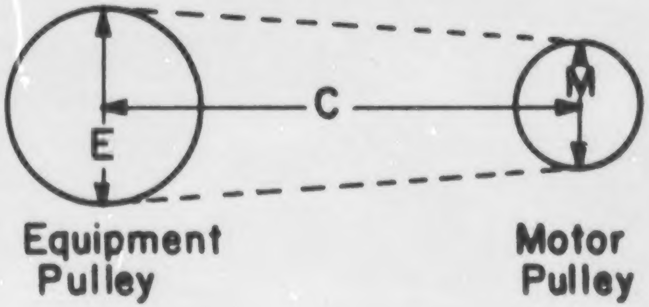
69

CHECKING BELT TENSION


(t) BELT SPAN
Motor Pulley
Driven Pulley

MEASURING FOR V – BELTS

4 x dia. largest pulley =
1.6 x dia. motor pulley =
1.6 x dia. eqpt. pulley = _____
Total Length =


E
C
M
Equipment Pulley
Motor Pulley

E + M x 1.57 + 2C = Length

E = Diameter of Driven Pulley
M = Diameter of Motor Pulley
C = Distance between pulley centers

TRANSPARENCY DISCUSSION GUIDE

UNDERSTANDING AND USING ELECTRIC MOTORS

Transparencies -- ADVANTAGES OF ELECTRIC MOTORS AND SELECTING ELECTRIC MOTORS

A. Use these transparencies to summarize discussions on purchasing electric motors.

B. Provide examples and comparisons of electric motors to power developed by hand and internal combustion engines.

C. Present examples of situations where students should select an electric motor of the proper size and type.

Transparency -- MODERN ELECTRIC MOTORS NAMEPLATE

A. Review the information contained on an electric motor nameplate. Have electric motors available for students to use.

B. Explain each part so students understand the importance of each section.

Transparencies -- CHARACTERISTICS OF SPLIT-PHASE MOTORS, CHARACTERISTICS OF CAPACITOR-START MOTORS, CHARACTERISTICS OF REPULSION-START MOTORS, and CHARACTERISTICS OF UNIVERSAL MOTORS

A. Use these transparencies to summarize and compare the differences among electric motors.

B. Have students look up the price of each type of electric motor and determine which would be the best buy for certain jobs and operating conditions.

C. Have students look up the price of each type of electric motor and determine which would be the best buy for certain jobs and operating conditions.

C. Have students examine each type of motor as it is discussed.

Transparencies -- CONNECTING SPLIT-PHASE MOTOR, CONNECTING CAPACITOR-START MOTOR, and CONNECTING REPULSION-START MOTOR

A. Use transparencies to supplement discussion on connecting electric motors to power sources.

B. Have students determine direction of rotation when given various wiring combinations.

C. Use the transparencies to supplement the Student Job Sheets on connecting and reversing electric motors.

Transparencies -- BELT ALIGNMENT, CHECKING BELT TENSION, and MEASURING FOR V-BELTS

A. Identify and discuss the problems caused by misalignment.

B. Demonstrate how to properly align an electric motor when installing it.

C. Demonstrate how to properly check and adjust belt tension.

D. Explain the importance of using the correct length of belts.

E. Have students calculate various problems to determine correct belt length.

TEACHER'S KEY

SAMPLE TEST QUESTIONS

UNDERSTANDING AND USING ELECTRIC MOTORS

PART I. True (+) - False (0)

0 1. A one horsepower gas motor can normally be replaced by a one-half horsepower electric motor.

0 2. The repulsion start motor requires the highest starting amps.

0 3. A motor with sleeve bearings may be mounted vertically.

+ 4. A 60 cycle, single phase current is found in most homes.

+ 5. Low speed electric motors are generally heavier than high speed motors of the same horsepower.

0 6. The thermal overload should be wired in parallel with both windings on the capacitor motor.

+ 7. The split-phase motor would be most apt to flicker lights when it starts.

+ 8. The stator windings of a repulsion motor should be wired in series for high voltage.

+ 9. Using the DC Test Set on a split phase motor, the starting winding will show a lower reading than the running winding.

0 10. Air compressors generally have split phase motors on them.

0 11. The repulsion motor is reversed by switching the starting winding leads.

+ 12. The capacitor motor has a squirrel cage rotor.

+ 13. The split phase motor can be reversed by switching the running winding leads.

0 14. If a motor will not run check for excessive load first.

+ 15. A motor shaft should not have any noticeable up and down play.

+ 16. Universal motors have a wound rotor and brushes.

0 17. A four pole electric motor will run at 3450 RPM.

0 18. A repulsion motor is usually used on a grinder.

+ 19. The largest split phase motor made is three-fourths horsepower.

0 20. Unlike poles of a magnet repel each other.

PART II. Multiple Choice

C 1. In alternating current, when we talk about phase we mean:
A. Capacity of a circuit.
B. Voltage of a circuit.
C. Time relationship of current flow.
D. Relationship of current to voltage and resistance.

A 2. A split-phase motor is known for its;
A. Low starting torque.
B. High starting torque.
C. High cost at purchase.
D. Low dependability.

D 3. A magnet made with turns of wire wound on a soft iron core with current to energize it is:
A. Natural magnet.
B. Permanent magnet.
C. Alloy magnet.
D. Electro-magnet.

C 4. The frequency of alternating current most used in the U.S.A. is:
A. 20 cycles.
B. 40 cycles.
C. 60 cycles.
D. 80 cycles.

A 5. A portable electric drill motor is an example of a:
A. Universal type motor.
B. Alternating current type motor.
C. Direct current type motor.
D. Split-phase induction motor.

B 6. Single phase electric motors often operate at efficiency levels of:
A. 95%.
B. 85%.
C. 75%.
D. 65%.

B 7. Like magnetic poles:
A. Attract each other.
B. Repel each other.
C. Have no effect on each other.
D. None of the above.

A 8. In a 60 cycle AC situation the electromagnetic field will either build or collapse:
A. 120 times per second.
B. 60 times per second.
C. 120 times per minute.
D. 60 times per minute.

D 9. The direction of rotation of a repulsion-start motor is determined by the:
A. Stator torque.
B. Rotor current.
C. Commutator circuit.
D. Brush position.

D 10. An electric motor used where high concentrations of dust are present should have a/an:
A. Open enclosure.
B. Splashproof enclosure.
C. Totally enclosed enclosure.
D. Explosion-proof enclosure.

PART III. Matching. Match the correct motor to the statement, some motors are used more than once.

Column A

G 1. Not electrically reversible and have low efficiency.
B 2. High first cost, more moving parts, wound rotor.
F 3. Consistent speed of operation.
A 4. Use wound motors but are not induction motors.
C 5. Low starting torque and high starting current, squirrel cage rotor.
E 6. Most popular for farm use, high starting torque.
D 7. Has six wires coming out of it.
A 8. Used on small appliances and portable tools.
E 9. Magnetic fields peak 120 degrees apart.

Column B

A. Universal motor
B. Repulsion start
C. Split-phase
D. Capacitor-start
E. Three-phase
F. Synchronous motors
G. Shaded-pole
H. Soft-start

H 10. Greatest horsepower on single-phase current.

PART IV. Completion

1. A universal motor will operate on either AC or DC on the correct voltage.

2. All electric motors consist essentially of a rotating part called the rotor which revolves within a stationary part called the stator.

3. The split-phase motor is an example of a motor with a squirrel cage type rotor while the repulsion-start motor is a type of a motor with a wound rotor.

4. A six pole motor has a full load running speed of 1140 r.p.m.

5. A two pole motor has a full running speed of 3450 r.p.m., while a four pole motor will run at 1725 r.p.m..

6. Some electric motors are made so that they can be hooked to either a high or low voltage (example 240 or 120 volts). The two halves of the windings are hooked in series for high voltage hook-up and in parallel for low voltage hook-up.

7. A repulsion-start motor has brushes. A wire is attached to each carbon brush. To what is the other end of the wire attached? To the other brush.

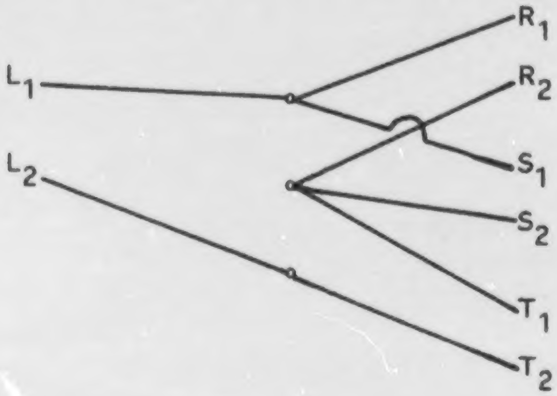
8. A motor will run on either 115 or 230 volts. The name plate is scratched so that all the information is not legible. It can be determined that the low voltage current rating is 11.8 amperes. Even though the high voltage current rating cannot be read, you would be safe in assuming that the rating is 5.9 amperes.

9. In a capacitor-start motor six wires are exposed at the junction box, 2 each leading to the overload protector, the running winding and starting winding. A DC test set is used to identify leads. A person begins testing wires at random and obtains these results:

   Wire 1 to Wire 2--0 amps
   Wire 1 to Wire 3--0 amps
   Wire 1 to Wire 4--7 amps
   Wire 2 to Wire 3--0 amps
   2 to 5--0 amps
   2 to 6--0 amps
   3 to 5--0 amps
   3 to 6--3 amps

   a. Which leads connect to the thermogard? 1 and 4
   b. Which leads connect to the starting winding? 2 and 5
   c. Which leads connect to the running winding? 3 and 6

10. Complete this diagram to hook up a capacitor-start motor with over-load protector. Connect wires L_1, L_2, R_1, R_2, S_1, T_1, T_2 to the three terminals indicated so the motor will run.



PART V. Essay

1. List five factors which should be considered when selecting electric motors.
(Refer to VAS Unit 3058, part 2.)

2. List steps to describe how to properly prepare an electric motor for storage.
(Refer to VAS Unit 3059, part 2.)

UNIT H: AGRICULTURAL MECHANICS

PROBLEM AREA: ADJUSTING AND MAINTAINING SPRAYING EQUIPMENT

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during the spring to prepare sprayers for field work. Some outside testing for calibration may be desirable.

The estimated time for this problem area is 5 to 7 days, depending on how far the teacher wishes to go in developing student competence with sprayers. If the students are to be involved with other activities, the instructional time will need to be increased.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

CREDIT SOURCES:

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The teacher's guide, student worksheets, job sheets, transparency discussion guide, and sample test questions were developed by Michael H. Rauch, Department of Vocational and Technical Education, University of Illinois. The artwork in this problem area was prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture teachers:

Eldon Chapman - Herscher High School
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John Bangert - LaSalle High School

TEACHERS' GUIDE

I. Unit: Agricultural mechanics

II. Problem area: Adjusting and maintaining spraying equipment

III. Objectives: At the end of this problem area students will be able to:

1. Calibrate a sprayer to the desired spraying rate.
2. Identify the parts of a field crop sprayer.
3. Properly calibrate rates given product labels.
4. Properly service and maintain a sprayer.
5. Comply with safety regulations concerning pesticide handling and application.

IV. Suggested interest approaches:

1. Discuss the problems of misapplication of chemicals relating to economics such as the "billion dollar blunder."
2. Discuss problems of misapplication in the field relating to crop damage and weed control failures.
3. Have a resource person come in and discuss the importance of sprayers.
4. Question the students about their own experiences with sprayers including injuries they've heard about in using sprayer.
5. Distribute the Competency Inventory sheets. Have students complete them and discuss the areas which they need more information and training.

V. Anticipated problems and concerns of students:

1. How do I calibrate a sprayer?
2. Are all sprayers the same?
3. How do I get a pesticide application certificate?
4. Is it better to have a mounted or trailer type sprayer?
5. How do I get the proper amount of chemical to add to the spray solution?

6. How do I apply pesticides safely?

7. How should a sprayer be maintained?

8. What is the best way to handle chemicals?

9. What are the parts of the sprayer?

10. What safety precautions should be followed when using and working with sprayers.

11. How do I determine what nozzle to use?

VI. Suggested learning activities and experiences:

1. Use one or more of the interest approaches listed in Section IV.

2. List problems and concerns of students and address them.

3. Distribute competency inventories to point out specific topics for discussion and instruction.

4. Show slide set on calibration of low-pressure field sprayers. (VAS 444-1) Calibration of Low-Pressure Sprayers.

5. Have students collect photographs of various sprayers in the community and post them to show the different types of sprayers available.

6. Show students the Delavan or Spraying Systems catalogs to show spraying equipment. (These catalogs are usually free from the company.)

7. Visit a commerical fertilizer outlet and have the representative explain some of the large spraying systems.

8. Present Cooperative Extension Circular 1192 and distribute Student Worksheet #1. Discuss spraying equipment with students.

9. Have students locate parts of a sprayer system on the school sprayer or have them diagram a system.

10. Show a number of different nozzles and explain their pattern and flow rate.

11. Discuss abrasive materials and the effect they have on pumps, tanks, and nozzles.

12. Discuss calibration and handout Worksheet #2.

13. Go through the steps of proper nozzle selection and precalibration checking as outlined in Circular 1192.

14. If possible, calibrate the school sprayer to various rates. Show the effects of nozzle spacing, ground speed, and pressure, in the school lot.

15. Give students problems for the home farm or sample problems from VAS Unit 444-1.

VII. Application procedures:

1. Students should acquire the knowledge and skills necessary to help on the home farm and in future employment.

2. Students may be able to apply these skills to their S.O.E.P. programs.

3. This problem area should contribute to preparation for FFA machinery contests.

VIII. Evaluation:

1. Collect and evaluate student worksheets.

2. Prepare and administer a pencil and paper test using the sample questions included with this problem area.

3. Check progress through use of the Competency Inventory.

IX. References and aids:

Vocational Agriculture Service, 1401 S. Maryland Drive, Urbana, IL 61801.

1. VAS Unit 444-1, Calibration of Low-Presure Sprayers

2. VAS Unit 444-3, Calibration of High-Capacity Sprayers

3. VAS Slide Set 444-1, Calibration of Low-Pressure Sprayers

4. VAS Sample problems Q444-1 and Key K444-1.

5. Cooperative Extension Service Circular 1192 (text for this unit)

6. Illinois Rural Core Curriculum III. Unit E: Crop Science, Problem Area: Handling Pesticides Safely.

7. Applying Pesticides, (1980) American Association for Vocational Instructional Materials, Engineering Center, Athens, Georgia 30602. (Student workbook available)

8. Transparencies included in this unit.

COMPETENCY INVENTORY

ADJUSTING AND MAINTAINING SPRAYING EQUIPMENT

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.

Competency	Circle One				
1. Store, handle, and apply chemicals safely.	1	2	3	4	5
2. Apply first aid to victims of chemical contact.	1	2	3	4	5
3. Determine factors affecting rate of application.	1	2	3	4	5
4. Calibrate application equipment.	1	2	3	4	5
5. Determine rate for proper control.	1	2	3	4	5
6. Calculate cost of chemical pest control.	1	2	3	4	5
7. Discuss the increase in production due to chemical pest control.	1	2	3	4	5
8. Identify symptoms of chemical overdose.	1	2	3	4	5
9. Follow safety precautions when applying pesticides.	1	2	3	4	5
10. Read and interpret pesticide labels.	1	2	3	4	5
11. Describe equipment characteristics.	1	2	3	4	5
12. Select chemicals for specific problems.	1	2	3	4	5
13. Know how to apply chemicals.	1	2	3	4	5
14. Adjust and care for equipment.	1	2	3	4	5
15. Repair and maintain equipment.	1	2	3	4	5

These competencies are outlined in the National Ag Occupations Competency Study, 1978, for entry level positions in agriculture.

Name ______________________ Date ______________

INFORMATION SHEET

CHARACTERISTICS OF PUMPS USED FOR SPRAYERS

Characteristic	Piston	Roller-Impeller	Flexible-Impeller	Gear	Diaphragm	Centrifugal
Adaptability	EC, SP, S, WP	EC, S	EC, SP, S, WP	EC, S	EC, SP, S, WP	EC, SP, S, WP
Durability	Basic parts have long life.	Pressure drops with wear.	Cannot be operated dry.	Limited life with abrasive or corrosive materials.	Maintains pressure with long use.	Pressure drops with wear.
Serviceability	Easily serviced.	Rollers easily replaced.	Impeller easily replaced. Pump	Parts normally not replaced. Pump replaced.	Easily serviced.	Certain models can be serviced easily.
Construction	Cylinders are stainless steel or porcelain lined.	Case of nickel-cast or cast iron. Rollers of nylon, rubber or teflon.	Neoprene impeller.	Case may cast iron or bronze. Bronze gears, stainless steel shaft.	Rubber or synthetic diaphragm.	Case usually cast iron. Impeller usually bronze or cast iron. Some small pumps made of plastic.

Pressure	138-5515 kPa (20-800 psi)	69-690 kPa (10-100 psi)	34-340 kPa (5-50 psi)	138-690kPa (20-100 psi)	69-690 kPa (10-100 psi)	34-482 kPa (5-70 psi)
Liters/minute Gallons/ minute	7.5-227 (2-60)	30-114 (8-30)	19-114 (5-30)	19-246 (5-65)	11-38 (3-10)	19-370 (5-100)
RPM	250-600	300-1750	500-1750	5001800	500-800	12003500
Horsepower Required	1-30	½-7	1/6-4	3-5	¼-6	
Displacement	Positive	Semi-positive	Non-positive	Positive	Positive	Non-positive
Direction of Rotation	Either	Clockwise	Either	Either	Either	Clockwise
Type of Drive	PTO, chain or engine.	PTO, belt or chain.	PTO, belt or chain.	PTO, belt or chain.	PTO	PTO, gear or belt.

STUDENT WORKSHEET #1

EQUIPMENT

Reference: Cooperative Extension Circular 1192

1. The pump is the ______ of the sprayer.

2. The two main types of low-pressure pumps used in the U.S. are _______ and ___________.

3. Roller pumps are ___________ displacement and are _____ priming.

4. What types of rollers are most resistant to agricultural chemicals?

5. Centrifugal pumps are _______________ displacement and __________ priming.

6. List some advantages of a centrifugal pump.

   ____________________________ _______________________

   ____________________________ _______________________

7. Name 5 different materials which spray tanks are made of.

   1. ____________, 2. _________________, 3. ___________________,

   4. ____________, 5. _________________,

8. Explain the pathway which an agricultural chemical takes from the spray tank to the nozzles?

   tank -

9. List 6 different types of nozzles?

   1. ____________________, 2. ________________, 3. _________________,

   4. ____________________, 5. ________________, 6. _________________,

10. Which nozzle is used for banding herbicides?

11. Which nozzle material wears the fastest?

12. What is the most common nozzle material?

13. Which hose (suction or pressure) should be larger?

14. What flow velocity is recommended for sprayer hoses?

15. List the steps involved in mantaining and cleaning your sprayer?

STUDENT WORKSHEET #2

CALIBRATION

Reference: Cooperative Extension Circular 1192

1. What 3 variables determine the amount of spray applied per acre?

   1)

   2)

   3)

2. How much must you change the pressure to double flow rate?

3. How much must you change ground speed to double the spray applied?

4. How much must you change nozzle spacing to apply ½ of present amount?

5. What are the 5 steps to selecting nozzle size?

   1)

   2)

   3)

   4)

   5)

6. How many ounces are in one gallon?

7. How many feet per minute is 1 MPH?

8. Suppose you want to apply a herbicide of 20 gallons per acre and travel 6 miles per hour. Your sprayer has nozzle spacings of 20 inches. What Flooding Flat-fan nozzle would you use? (Show your work)

STUDENT WORKSHEET #3

SPRAYER TERMS WORD SEARCH

D A L A G U F K B N P A L R E V O E G L Q T M
D E F H J O L P U R M X O T S A C D A O R B D
I R E K N N A F F W J G W O L F N E V E R R G
E I N P I S T O N Q A V P I P F N S J J Y F K
L A Z A S H F C A L I B R A T I O N N B Y C I
B L K T H D A R L M S K E P T M T Y O O Y H M
A H D T Y P N O M I E S S P M U P O T E L V D
T F D E C L N U P S N I S U F V M U L E F Y S
E I F R G H Q G O S E D U Y R L N L A C F T N
W B I N L M W H I R L U R E L L O R H I L A C
A E M U N I M U L A G S E Z R R L T H L O T S
L R X H I G H P R E S S U R E O N A A E O A T
A G J E P S R A L U N A R G W T P V L T D P R
G L S R A Y S R E Y A R P S V G T E L U I X A
U A R B N G C L O D W B M O O B T E W N N O I
F S O I S L A C I M E H C P A F F I K I G P N
I S T C P H O L L O W C O N E J D I N M C H E
R N A I X P P A V L W R N K C E T O V C P K R
T I T D U M J V K A D X O Q A T A E L M H G S
N S I E E L Z Z O N N P Q N B A N Z C D V E G
E O G F J C E L I O U I G E R S K C Y N W X S
C X A K D M N A F F C L Z Q K T S U A B U F G
F Z C E N T R I F U E E N E L Y H T E Y L O P

Aerial
Agitators
Aluminum
Brass
Broadcast
Calibration
Centrifugal
Chemicals
Dry boom
Even flow
FFA (5)
Fiberglass
Flat fan
Flooding
Flotation
Gallon
Galvanize
GPA
GPM

Granular
Ground speed
Herbicide
High pressure
Hollow cone
Hose
Inches
Low pressure
MPH
Minute
Nozzle
Nylon
OPM
Ounce
Overlap
Pattern
Piston
Polyethylene

PSI
Pumps
PTO
Raindrop
Roller
Ropewick
RPM
Safety
Sprayers
Strainers
Tanks
Tip
Votec
Wetable
Wet boom
Whirl
Wide angle
Width

TEACHER'S KEY

STUDENT WORKSHEET #1

EQUIPMENT

Reference: Cooperative Extension Circular 1192

1. The pump is the heart of the sprayer.

2. The two main types of low-pressure pumps used in the U.S. are roller and centrifugal.

3. Roller pumps are positive displacement and are self priming.

4. What types of rollers are most resistant to agricultural chemicals?

   Nylon or Teflon

5. Centrifugal pumps are not positive displacement and not self priming.

6. List some advantages of a centrifugal pump.

   durable

   simply constructed

   can handle abrasive material

   high output

7. Name 5 different materials which spray tanks are made of.

   1. Fiberglass, 2. Stainless Steel, 3. Galvanized steel,

   4. Aluminum, 5. Polyethylene

8. Explain the pathway which an agricultural chemical takes from the spray tank to the nozzles?

   tank - shutoff valve - pump - strainer - flow-control valve - boom control - boom - nozzles

9. List 6 different types of nozzles?

   1. Regular Flat-fan, 2. Even Flat-fan, 3. Flooding Flat-fan

   4. Hollow-Cone, 5. Raindrop, 6. Whirlchamber

10. Which nozzle is used for banding herbicides?

    Even Flat Fan

11. Which nozzle material wears the fastest?

Aluminium

12. What is the most common nozzle material?

Brass

13. Which hose (suction or pressure) should be larger?

Suction

14. What flow velocity is recommended for sprayer hoses?

5-6 feet/sec.

15. List the steps involved in mantaining and cleaning your sprayer?

    1. Use clean water.
    2. Check and clean strainers daily.
    3. Do not use metal objects to clean nozzles.
    4. Flush a new sprayer before using.
    5. Clean your sprayer.
    6. Store your sprayer with a protective oil coating.
    7. Corrosive fertilizers should not be used in some sprayers.

TEACHER'S KEY

STUDENT WORKSHEET #2

CALIBRATION

Reference: Cooperative Extension Circular 1192

1. What 3 variables determine the amount of spray applied per acre?

   1) Nozzle flow rate

   2) Ground speed

   3) Effective width per nozzle

2. How much must you change the pressure to double flow rate?

   4x greater

3. How much must you change ground speed to double the spray applied?

   ½ less

4. How much must you change nozzle spacing to apply ½ of present amount?

   2x greater

5. What are the 5 steps to selecting nozzle size?

   1) Select rate applied in GPA.

   2) Select ground speed in MPH.

   3) Determine effective spray width per nozzle in inches.

   4) Determine the flow rate required from each nozzle.

   5) Select a nozzle to give you the proper flow rate.

6. How many ounces are in one gallon?

   128 oz.

7. How many feet per minute is 1 MPH?

   88 ft.

8. Suppose you want to apply a herbicide of 20 gallons per acre and travel 6 miles per hour. Your sprayer has nozzle spacings of 20 inches. What Flooding Flat-fan nozzle would you use? (Show your work)

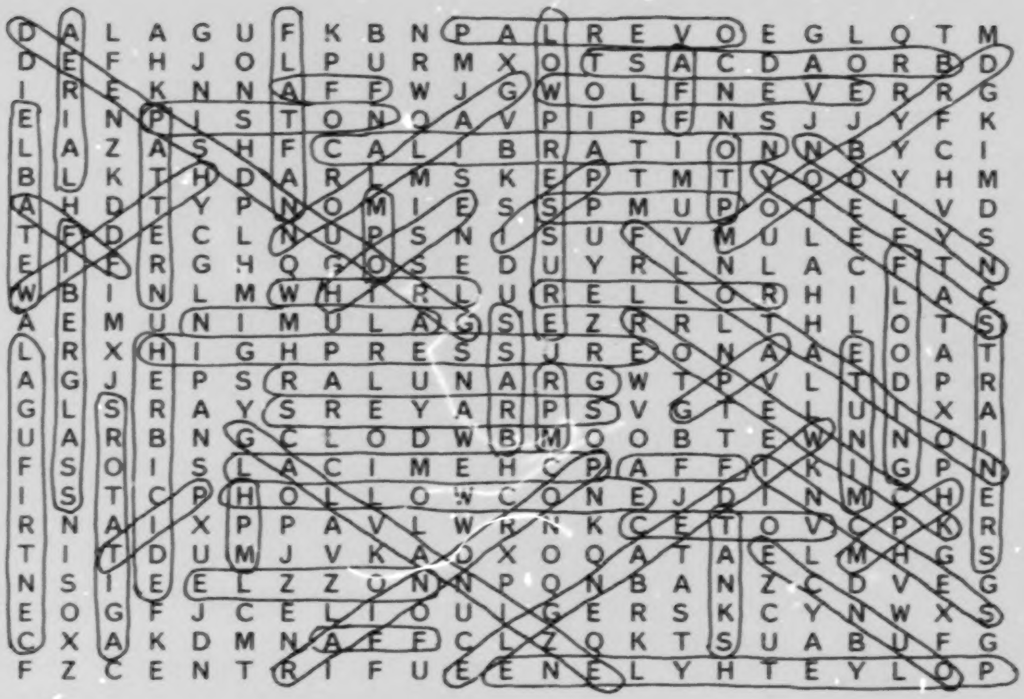
$$\text{GPM} = \frac{20 \times 6 \times 20}{5940} = \frac{2400}{5940} = .404$$

Delavan D2 or Spraying Systems TK2 at 40 psi
Delavan D3 or Spraying Systems TK3 at 18 psi
Delavan D4 or Spraying Systems TK4 at 10 psi

TEACHER'S KEY

STUDENT WORKSHEET #3

SPRAYER TERMS WORD SEARCH



D	A	L	A	G	U	F	K	B	N	P	A	L	R	E	V	O	E	G	L	O	T	M
D	E	F	H	J	O	L	P	U	R	M	X	O	T	S	A	C	D	A	O	R	B	D
I	R	E	K	N	N	A	F	F	W	J	G	W	O	L	F	N	E	V	E	R	R	G
E	I	N	P	I	S	T	O	N	O	A	V	P	I	P	F	N	S	J	J	Y	F	K
L	A	Z	A	S	H	F	C	A	L	I	B	R	A	T	I	O	N	N	B	Y	C	I
B	L	K	T	H	D	A	R	L	M	S	K	E	P	T	M	T	Y	O	O	Y	H	M
A	H	D	T	Y	P	N	O	M	I	E	S	S	P	M	U	P	O	T	E	L	V	D
T	F	D	E	C	L	N	U	P	S	N	I	S	U	F	V	M	U	L	E	E	Y	S
E	I	F	R	G	H	O	G	O	S	E	D	U	Y	R	L	N	L	A	C	F	T	N
W	B	I	N	L	M	W	H	I	R	L	U	R	E	L	L	O	R	H	I	L	A	C
A	E	M	U	N	I	M	U	L	A	G	S	E	Z	R	R	L	T	H	L	O	T	S
L	R	X	H	I	G	H	P	R	E	S	S	J	R	E	O	N	A	A	E	O	A	T
A	G	J	E	P	S	R	A	L	U	N	A	R	G	W	T	P	V	L	T	D	P	R
G	L	S	R	A	Y	S	R	E	Y	A	R	P	S	V	G	T	E	L	U	I	X	A
U	A	R	B	N	G	C	L	O	D	W	B	M	O	O	B	T	E	W	N	N	O	I
F	S	O	I	S	L	A	C	I	M	E	H	C	P	A	F	F	T	K	I	G	P	N
I	S	T	C	P	H	O	L	L	O	W	C	O	N	E	J	D	I	N	M	C	H	E
R	N	A	I	X	P	P	A	V	L	W	R	N	K	C	E	T	O	V	C	P	K	R
T	I	T	D	U	M	J	V	K	A	O	X	O	O	A	T	A	E	L	M	H	G	S
N	S	I	E	E	L	Z	Z	O	N	N	P	O	N	B	A	N	Z	C	D	V	E	G
E	O	G	F	J	C	E	L	I	O	U	I	G	E	R	S	K	C	Y	N	W	X	S
C	X	A	K	D	M	N	A	F	F	C	L	Z	O	K	T	S	U	A	B	U	F	G
F	Z	C	E	N	T	R	I	F	U	E	E	N	E	L	Y	H	T	E	Y	L	O	P

Aerial
Agitators
Aluminum
Brass
Broadcast
Calibration
Centrifugal
Chemicals
Dry boom
Even flow
FFA (5)
Fiberglass
Flat fan
Flooding
Flotation
Gallon
Galvanize
GPA
GPM

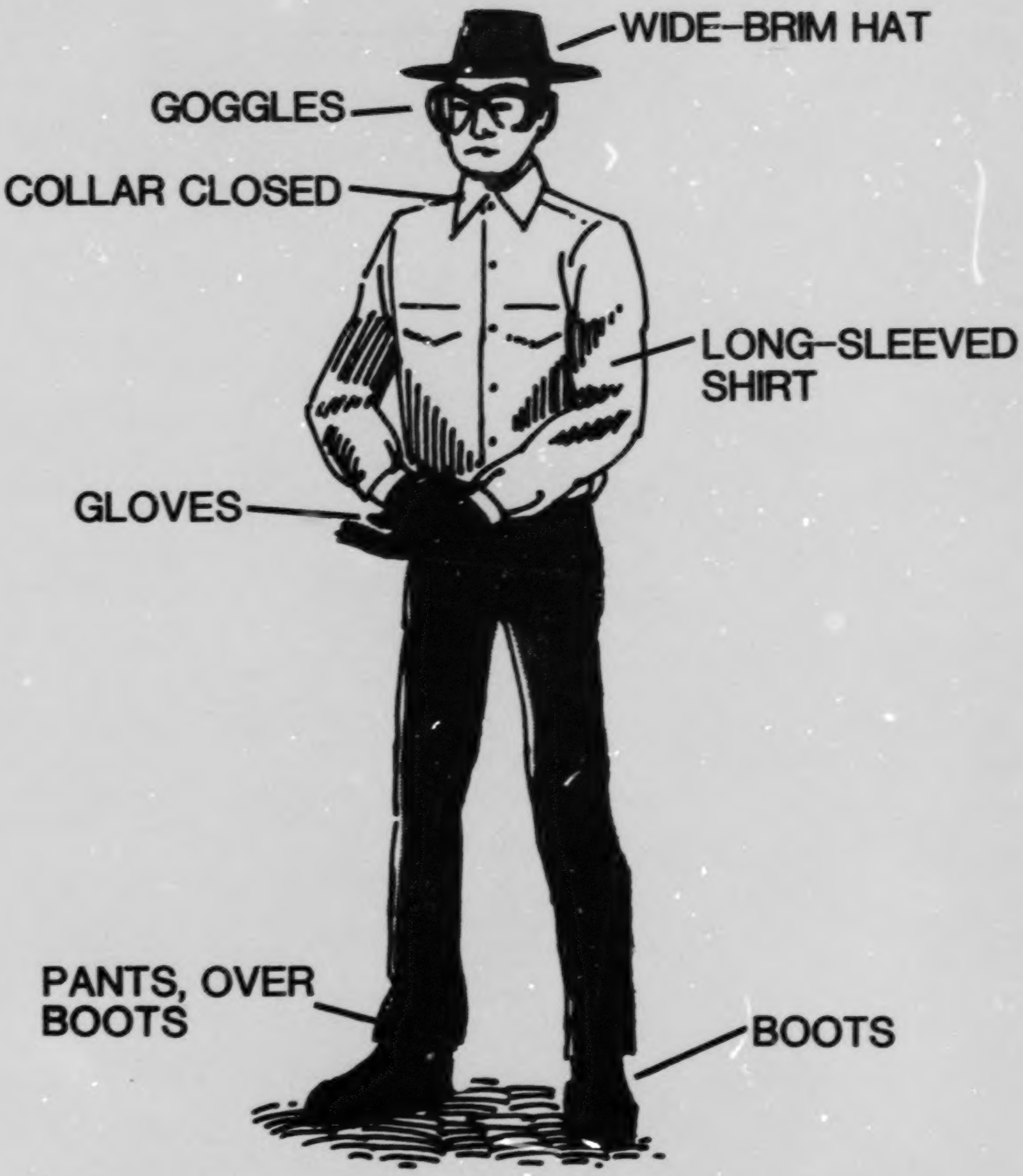
Granular
Ground speed
Herbicide
High pressure
Hollow cone
Hose
Inches
Low pressure
MPH
Minute
Nozzle
Nylon
OPM
Ounce
Overlap
Pattern
Piston
Polyethylene

PSI
Pumps
PTO
Raindrop
Roller
Ropewick
RPM
Safety
Sprayers
Strainers
Tanks
Tip
Votec
Wetable
Wet boom
Whirl
Wide angle
Width

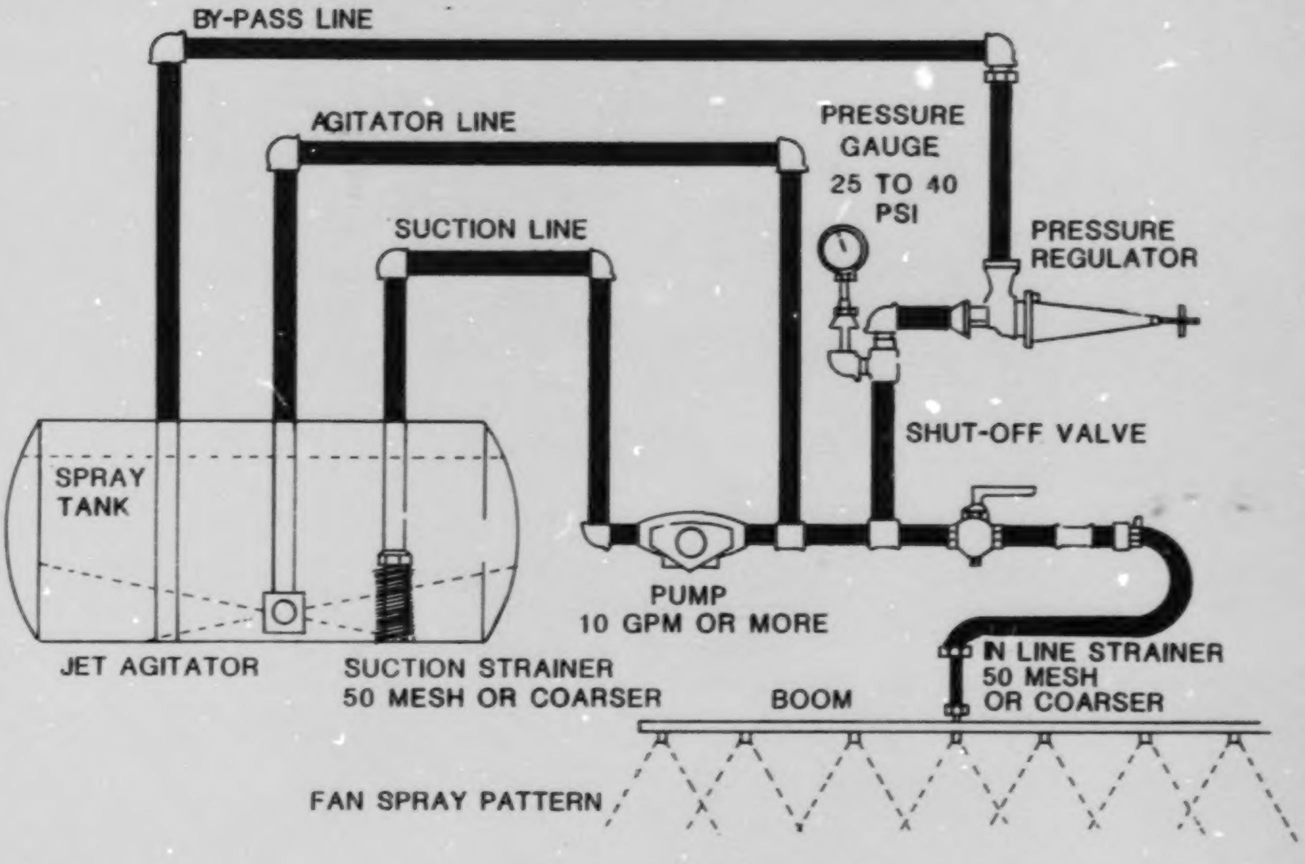
An Important List

1. *The right pesticide and equipment*
2. *Read and heed the label*
3. *Protective clothing*
4. *Accurate and careful mixing*
5. *Proper disposal*
6. *Correct application rate*
7. *Careful handling*
8. *Mark treated areas*
9. *Proper storage*
10. *Dispose of excess pesticides*
11. *Identify pesticide storage*

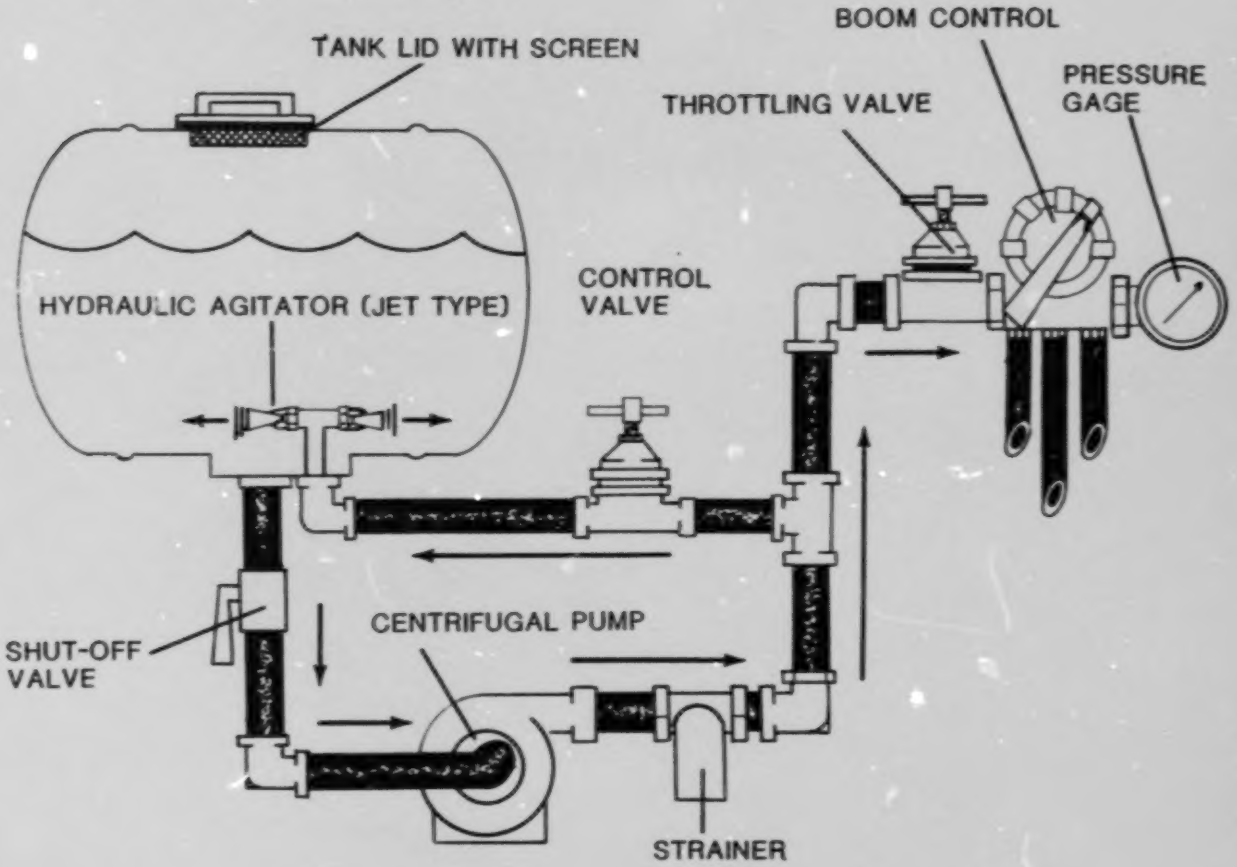
DRESS LIKE THIS WHEN USING POISON


WIDE–BRIM HAT
GOGGLES
COLLAR CLOSED
LONG–SLEEVED SHIRT
GLOVES
PANTS, OVER BOOTS
BOOTS

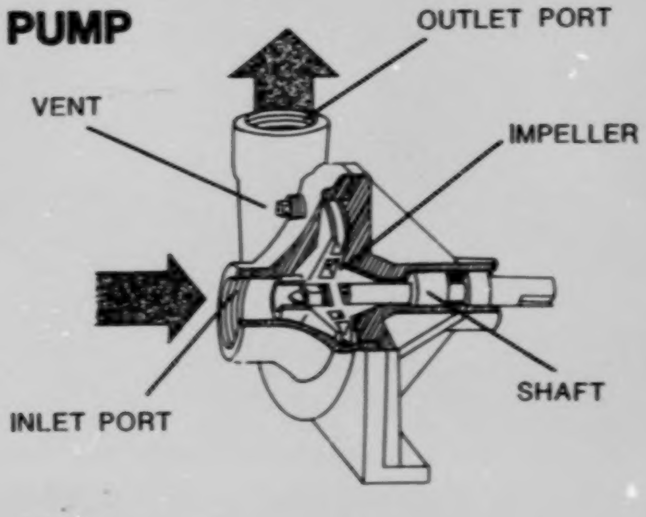
MAIN PARTS OF A SPRAYER


BY-PASS LINE
AGITATOR LINE
PRESSURE GAUGE
25 TO 40 PSI
SUCTION LINE
PRESSURE REGULATOR
SHUT-OFF VALVE
SPRAY TANK
PUMP
10 GPM OR MORE
JET AGITATOR
SUCTION STRAINER
50 MESH OR COARSER
IN LINE STRAINER
50 MESH
OR COARSER
BOOM
FAN SPRAY PATTERN

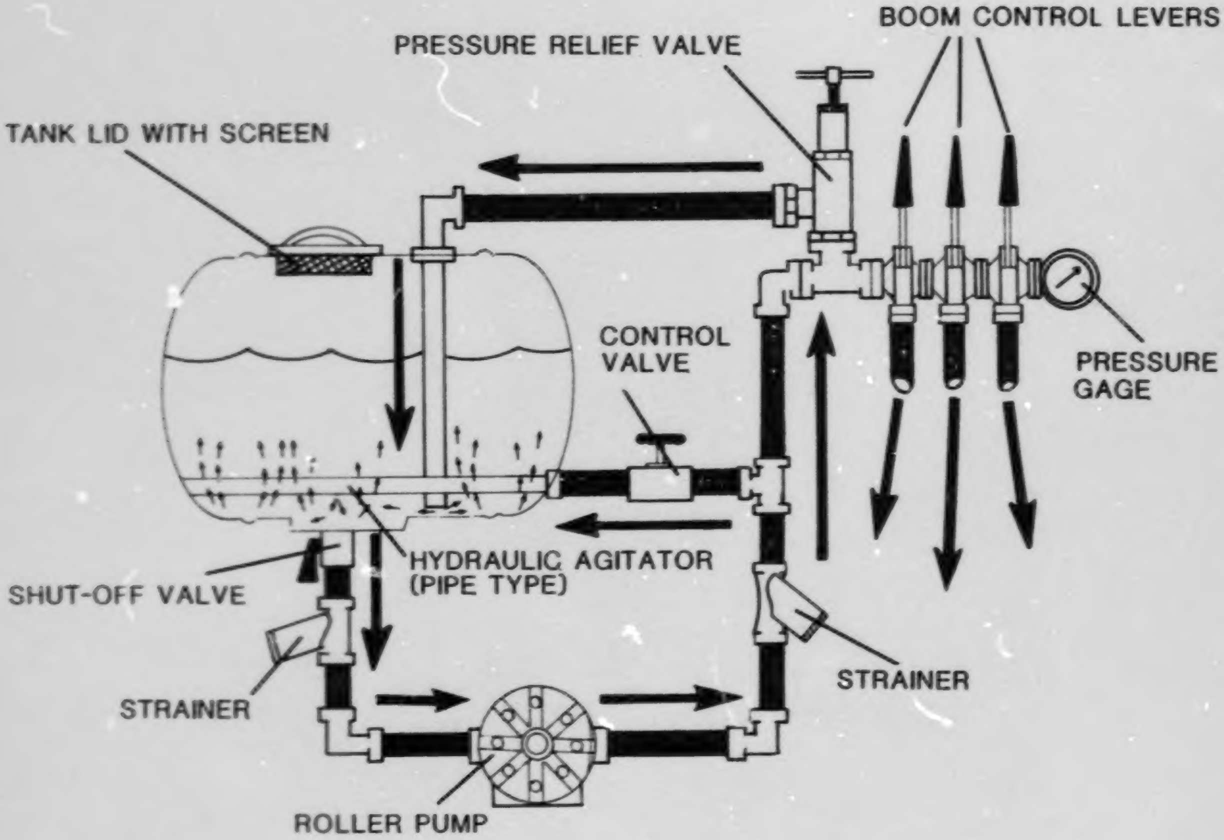
CENTRIFUGAL PUMP SPRAYING SYSTEM


TANK LID WITH SCREEN
BOOM CONTROL
PRESSURE GAGE
THROTTLING VALVE
CONTROL VALVE
HYDRAULIC AGITATOR (JET TYPE)
CENTRIFUGAL PUMP
SHUT-OFF VALVE
STRAINER

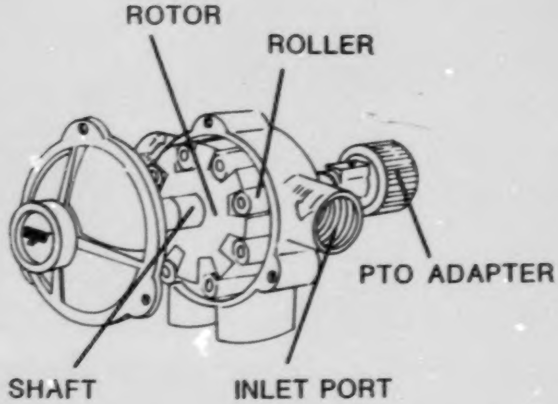
TYPICAL CENTRIFUGAL PUMP (CUTAWAY)


OUTLET PORT
VENT
IMPELLER
SHAFT
INLET PORT

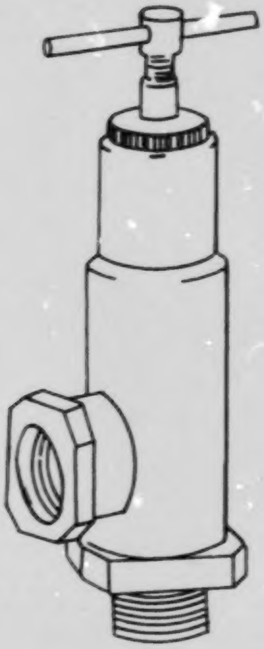
ROLLER PUMP SPRAYING SYSTEM

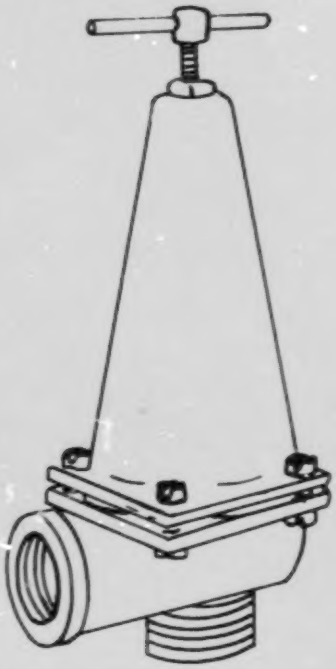

BOOM CONTROL LEVERS
PRESSURE RELIEF VALVE
TANK LID WITH SCREEN
CONTROL VALVE
PRESSURE GAGE
HYDRAULIC AGITATOR (PIPE TYPE)
SHUT-OFF VALVE
STRAINER
STRAINER
ROLLER PUMP

TYPICAL ROLLER PUMP (CUTAWAY)

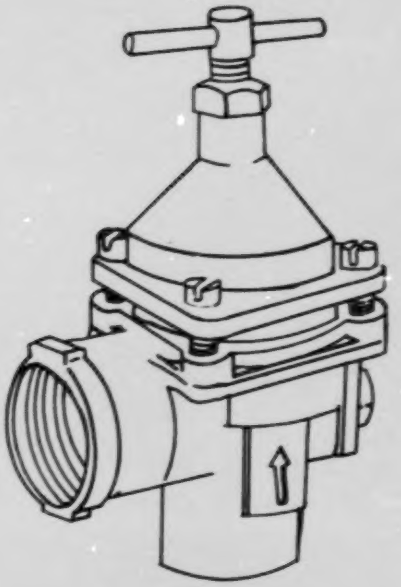

ROTOR
ROLLER
PTO ADAPTER
SHAFT
INLET PORT

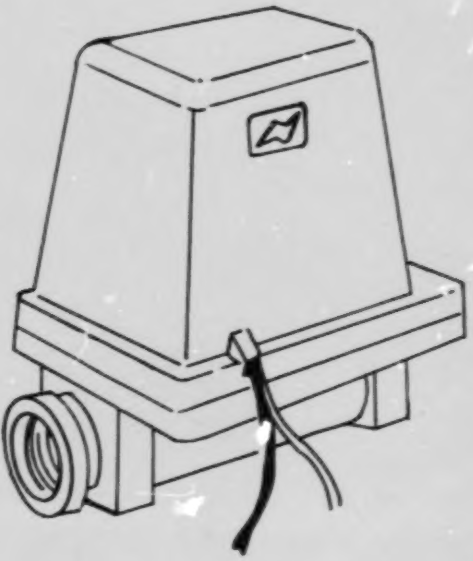
TYPES OF PRESSURE RELIEF VALVES (ROLLER PUMPS)



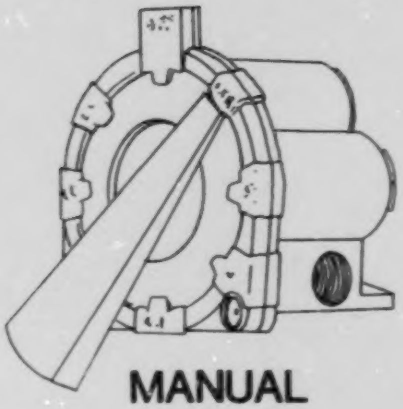


TYPES OF THROTTLING VALVES (CENTRIFUGAL PUMPS)

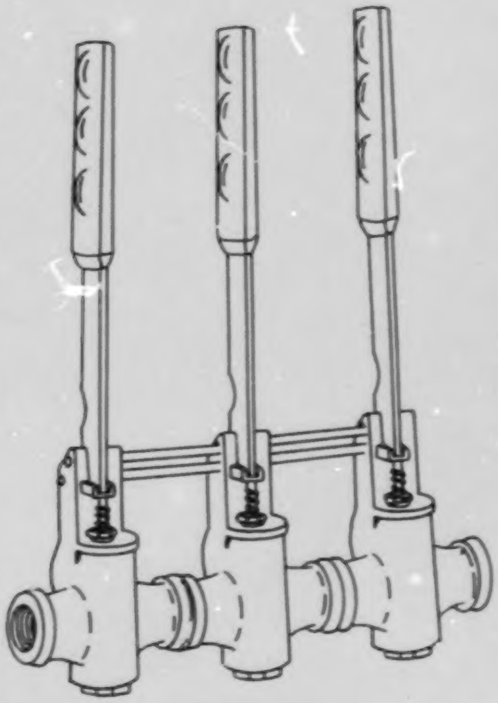




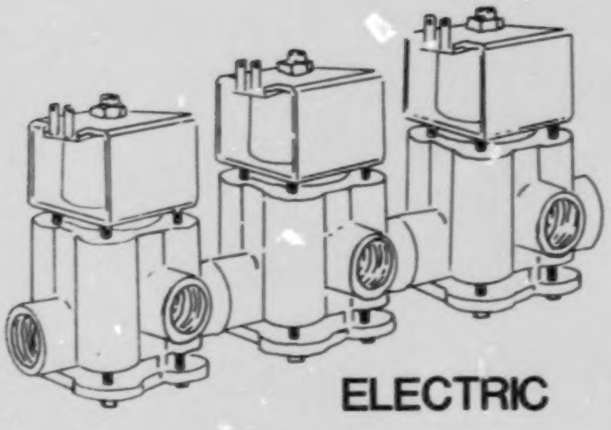
TYPES OF BOOM CUT-OFF VALVES



MANUAL

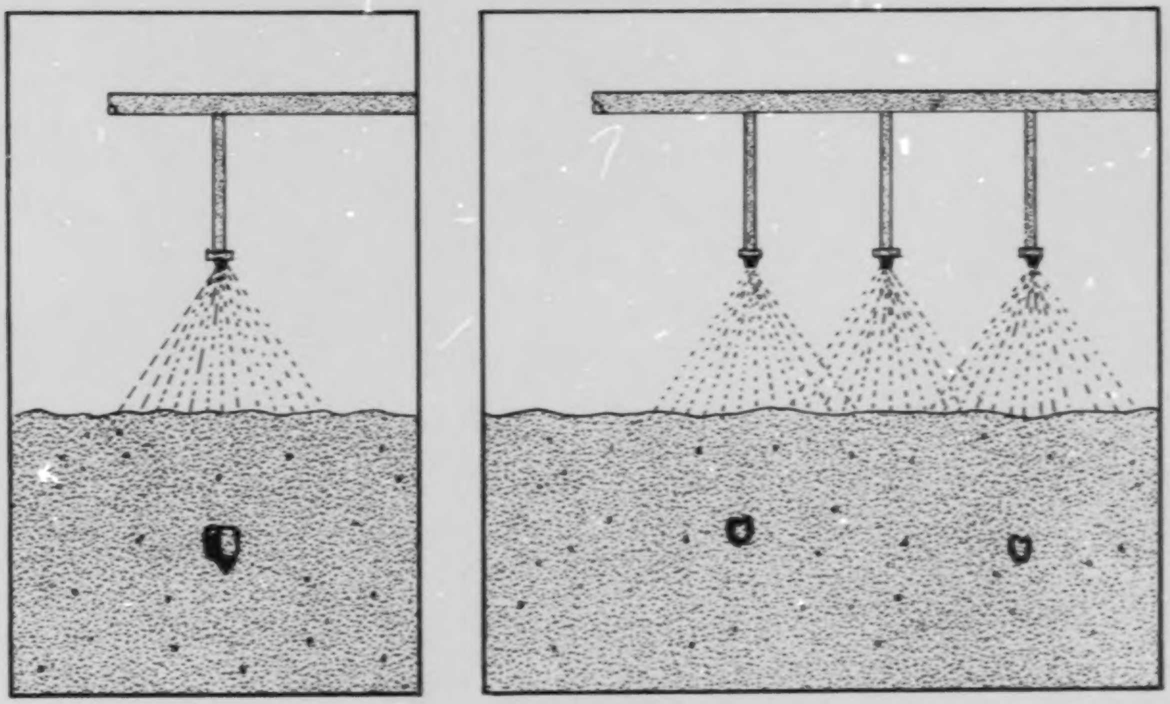


MANUAL



ELECTRIC

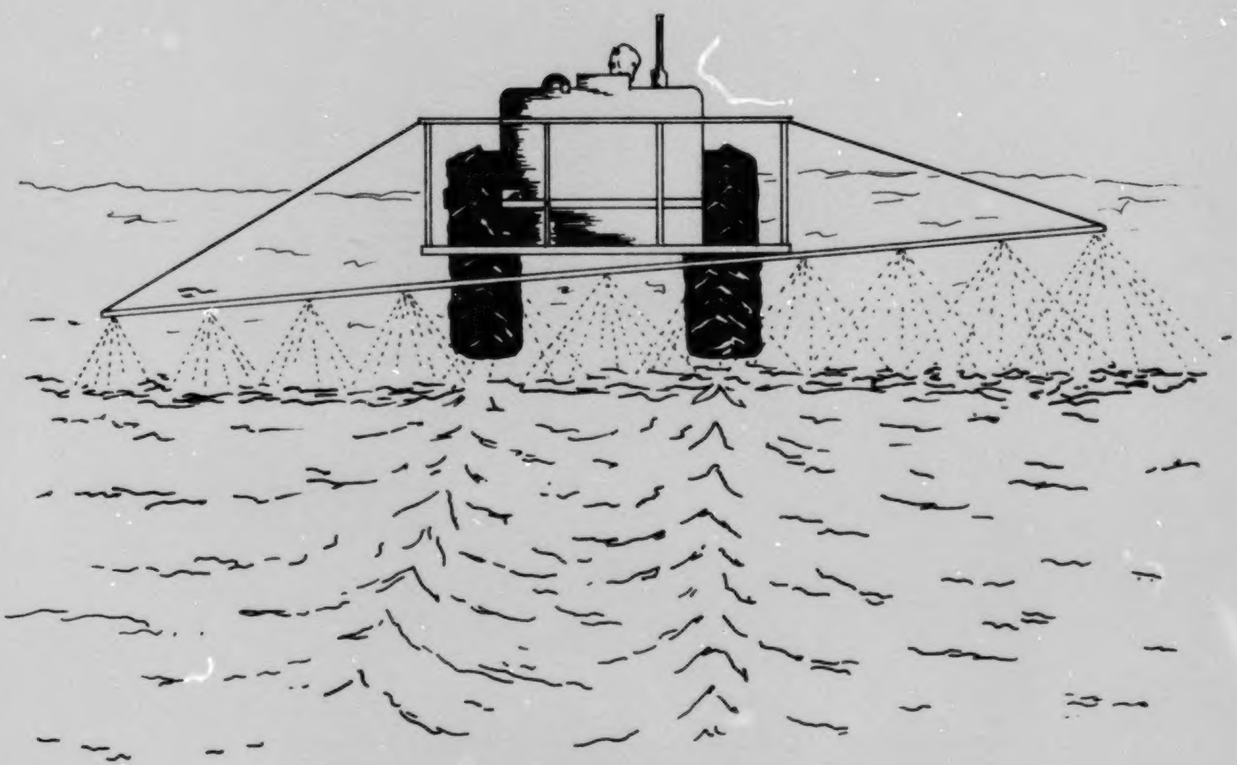
COMPARISON OF BAND AND BROADCAST SPRAY APPLICATION



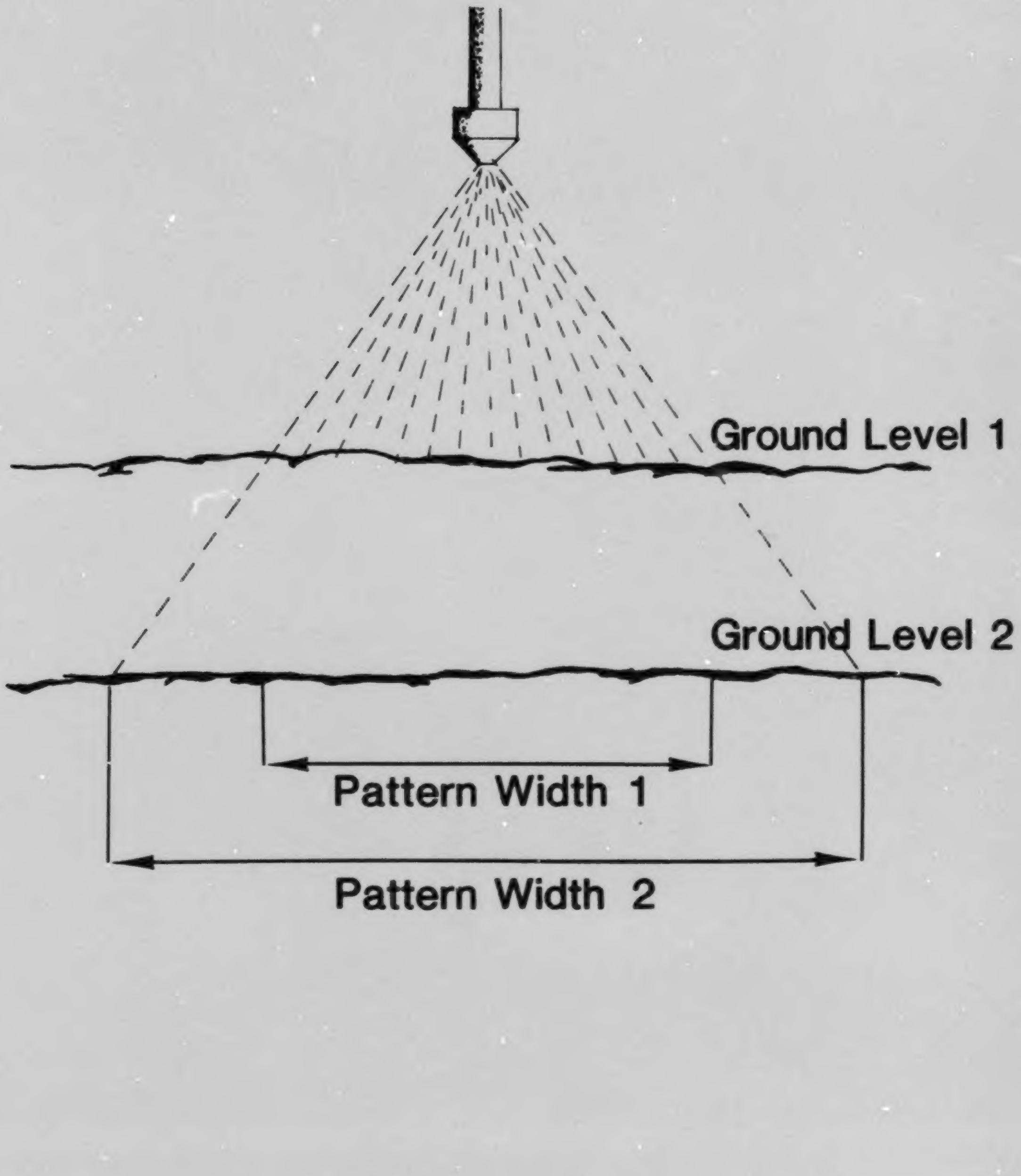
BAND

BROADCAST

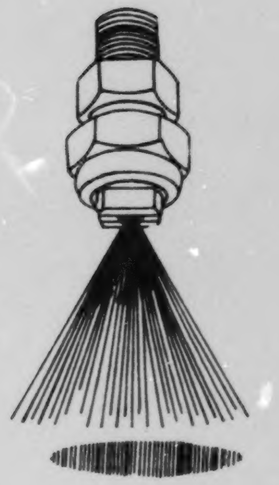
BOOM MUST BE LEVEL FOR UNIFORM APPLICATION


TOO LOW
CORRECT
TOO HIGH

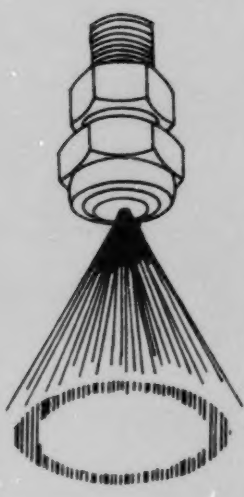
NOZZLE HEIGHT DETERMINES SPRAY PATTERN WIDTH


Ground Level 1
Ground Level 2
Pattern Width 1
Pattern Width 2

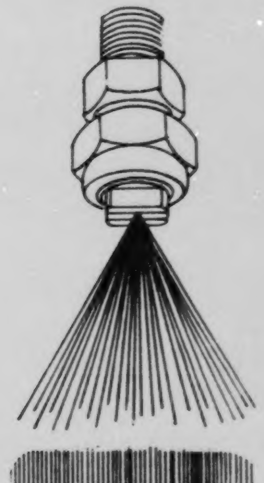
TYPES OF NOZZLES AND NOZZLE SPRAY PATTERNS



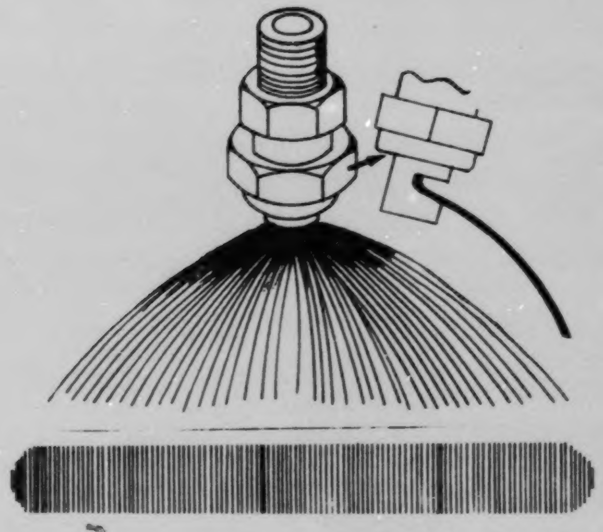
Regular Flat Fan



Hollow Cone

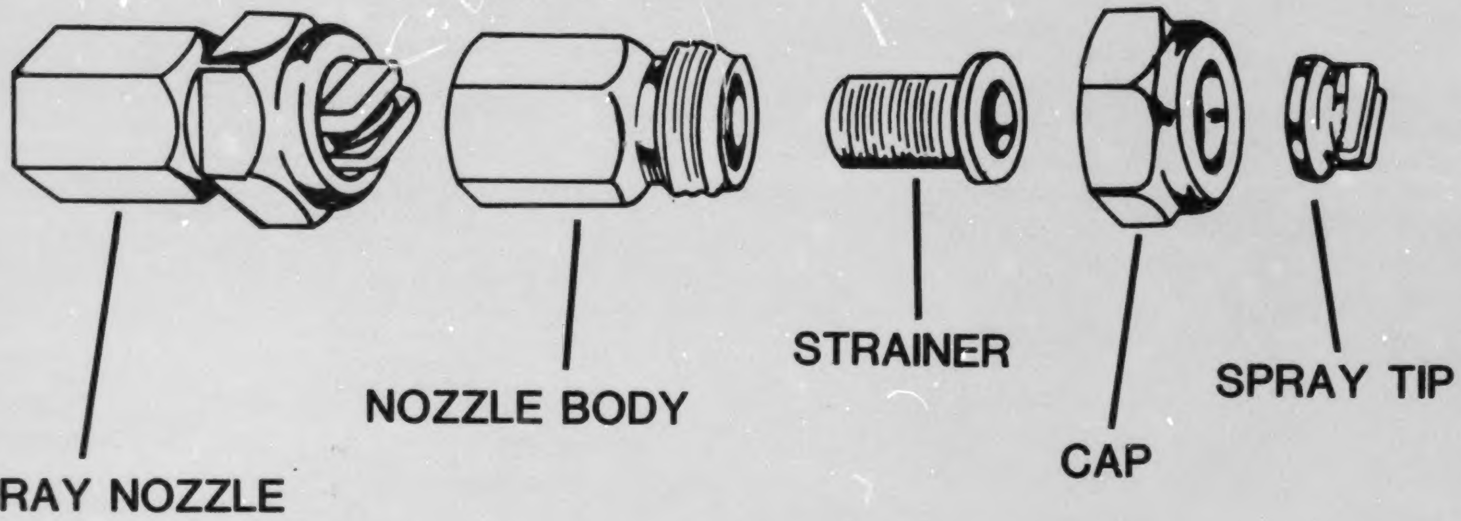


Even Flat Fan

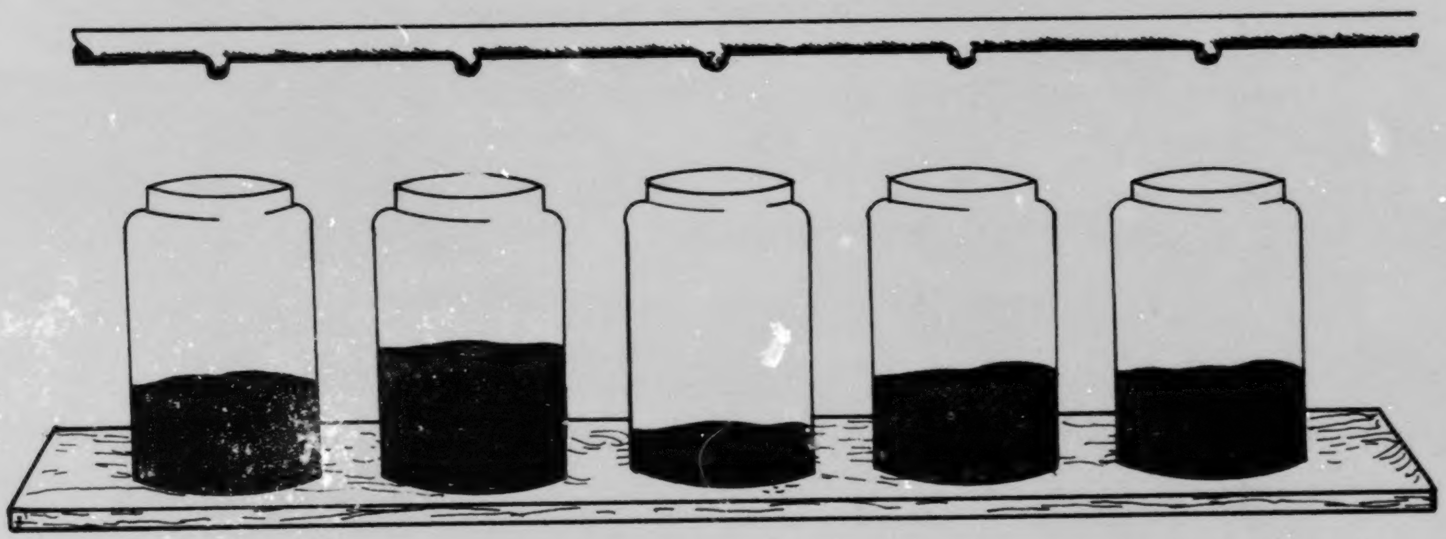


Flooding Flat Fan

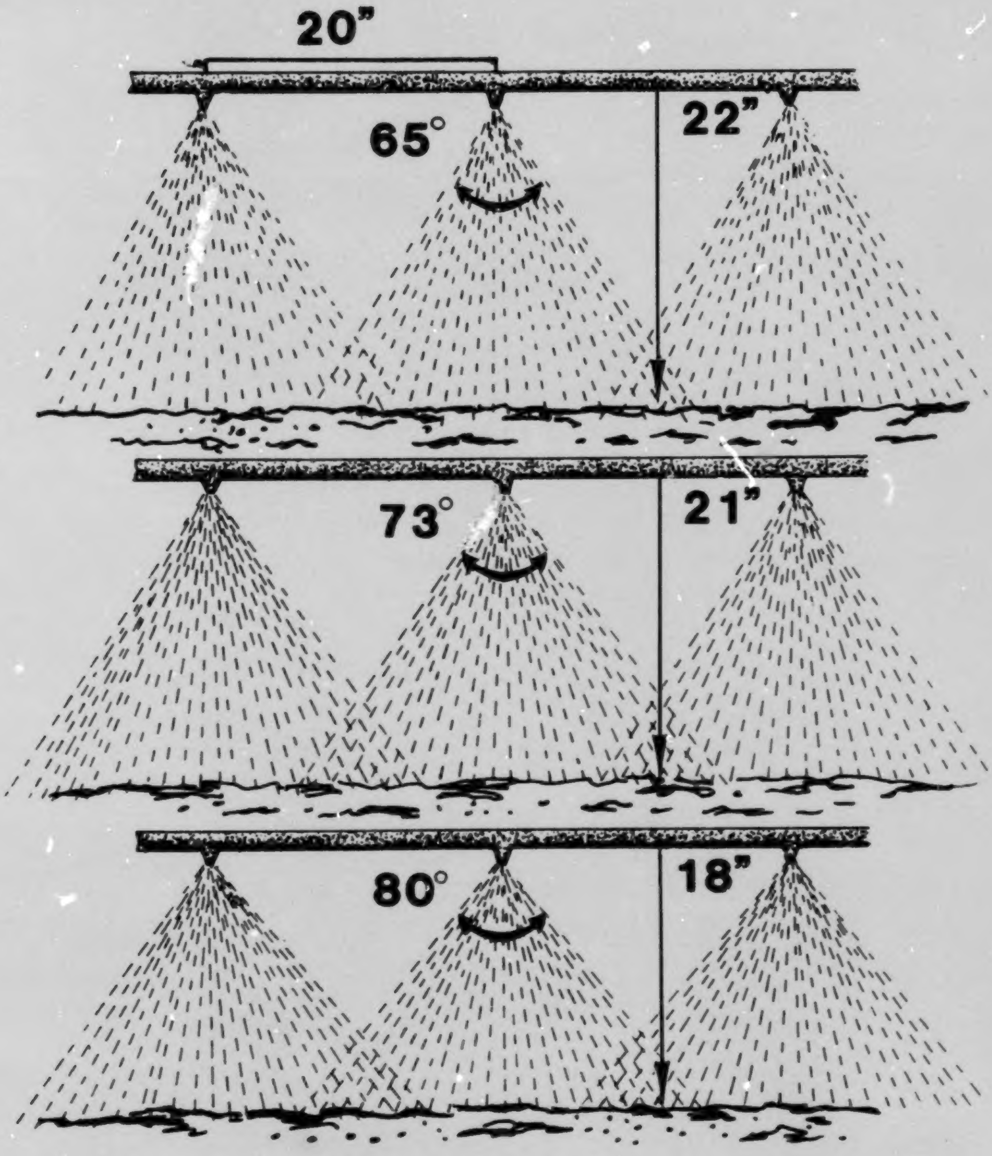
PARTS OF A NOZZLE


SPRAY NOZZLE
NOZZLE BODY
STRAINER
CAP
SPRAY TIP

CHECK NOZZLES FOR EQUAL FLOW



THE NOZZLE SPRAY PATTERN ANGLE DETERMINES PATTERN WIDTH FOR GIVEN HEIGHT


20"
65°
22"
73°
21"
80°
18"

TRANSPARENCY DISCUSSION GUIDE

ADJUSTING AND MAINTAINING SPRAYING EQUIPMENT

Transparencies -- AN IMPORTANT LIST, and DRESS LIKE THIS WHEN USING POISON

A. Review and discuss the importance of proper pesticide handling.

B. Point out that careful use can reduce the risk of personal and environmental harm.

C. Ask students how they dress when they are going to be handling pesticides. Discuss the importance of proper dress.

Transparencies -- MAIN PARTS OF A SPRAYER, CENTRIFUGAL PUMP SPRAYING SYSTEM, ROLLER PUMP SPRAYING SYSTEM, and TYPES OF PRESSURE RELIEF VALVES

A. Have students identify the main parts of a sprayer.

B. Discuss the function and operation of each part.

C. Identify and discuss the differences between the two types of spraying systems. Suggest situations where each type is used.

D. Have students identify which type they use and let them discuss their experiences and problems.

Transparency -- TYPES OF BOOM CUT-OFF VALVES

A. Have students identify the types of valves they have on their equipment.

B. Discuss where each of the valves would be used on a field sprayer.

Transparencies -- COMPARISON OF BAND AND BROADCAST SPRAY APPLICATION, and BOOM MUST BE LEVEL FOR UNIFORM APPLICATION, NOZZLE HEIGHT AND SPRAY WIDTH

A. Review the relationship between boom height and evenness of coverage.

B. Discuss the advantages and disadvantages of band and broadcast applications.

C. Suggest situations where each type should and should not be used.

Transparencies -- TYPES OF NOZZLES AND NOZZLE SPRAY PATTERNS, PARTS OF A NOZZLE, CHECKING NOZZLES FOR EQUAL FLOW, and NOZZLE ANGLE DETERMINES PATTERN

A. Review the importance of using good quality nozzles on field sprayers.

B. Discuss the relationship between nozzle condition and application rate.

C. Point out the importance of proper nozzle angle.

D. Identify and discuss the major parts of a nozzle. Demonstrate how to properly check and clean nozzles.

TEACHER'S KEY

SAMPLE TEST QUESTIONS

ADJUSTING AND MAINTAINING SPRAYING EQUIPMENT

PART I. True or False

_T_ 1. More pesticides are applied with low pressure sprayers than with any other kind of equipment.

_F_ 2. Some pumps are 100% efficient.

_F_ 3. Brass nozzles wear the fastest.

_F_ 4. Centrifugal pump systems require a pressure relief valve.

_T_ 5. Centrifugal pumps are used for higher outputs.

_T_ 6. Roller pumps are positive displacement pumps.

_T_ 7. Hydraulic agitation is most common on low-pressure sprayers.

_F_ 8. Pressure lines should be greater than suction lines.

_F_ 9. Doubling the pressure will double the flow rate.

_T_ 10. Doubling the ground speed will cut the rate in half.

PART II. Multiple Choice

_A_ 1. ________ pumps are popular because of low cost, compact size, and efficient operation at tractor pto speeds.

A) Roller
B) Centrifugal
C) Diaphragm
D) Piston
E) None

_B_ 2. Which tank material is resistant to all crop chemicals?

A) Fiberglass
B) Stainless Steel
C) Galvanized
D) Polyethylene
E) Aluminum
F) None of the above
G) All of the above

E 3. The amount of flow needed for agitation depends on the

A) Chemical used
B) Size of tank
C) Shape of tank
D) None of the above
E) All of the above

A 4. Flow control assemblies of a bypass pressure regulator or relief valve, a control valve, a pressure gauge, and boom shut off valve is used for ________ pumps.

A) Roller
B) Centrifugal
C) Diaphragm
D) None of the above
E) All of the above

C 5. Pump output of 20 gallons per minute should have at least ______ inch suction hose.

A) 1/2
B) 3/4
C) 1
D) 1½
E) None of the above

B 6. __________ nozzles should be used for banding.

A) Regular Flat-Fan
B) Even Flat-Fan
C) Flooding Flat-Fan
D) Hollow cone
E) None of the above
F) All of the above

F 7. Nozzle tips are made of

A) Stainless steel
B) Aluminum
C) Brass
D) Nylon
E) None of the above
F) All of the above

B 8. Nozzles spaced at 20 inches, using 50% overlap, will have the spray patterns overlap ______ inches.

A) 5
B) 10
C) 15
D) 20
E) 40

A 9. Variables that affect the amount of spray applied are

- A) Size of nozzle
- B) Size of tank
- C) Size of pump
- D) Size of tractor
- E) None of these
- F) All of these

E 10. Selection of a nozzle tip depends on

- A) GPA
- B) MPH
- C) W
- D) None of above
- E) All of these

PART III. Matching P-Pump N-Nozzle V-Valve C-Calibration

N 1. Brass
C 2. GPA
V 3. Throttling
N 4. Aluminum
P 5. Centrifugal
N 6. Hollow-cone
N 7. Raindrop
N 8. Even Flat-Fan
N 9. Flooding Flat-Fan
C 10. GPM
P 11. Roller
V 12. Pressure-relief
N 13. Nylon
C 14. MPH
P 15. Piston

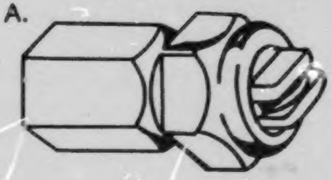
PART IV. Fill in the blank

1. Spray application rate varies inversely with the ground speed.
2. Width of area sprayed is measured in inches.
3. Throttling valves are used wth centrifugal pumps.
4. Agitation requirements depend on the formulation of the chemical applied.
5. Mechanical agitators are propellors or paddles mounted in the tank.
6. A pressure gauge must be used for calibrating.
7. Centrifugal pump output decreases when pressure reaches 40 psi.
8. The pump is the heart of the sprayer.
9. Corrosion is the biggest draw back of galvanized tanks.
10. Pressure should not be used to make major changes in application rates.

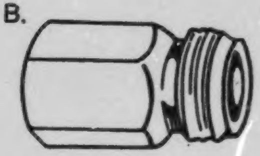
PART V. Identification:

1. Strainer C
2. Cap D
3. Nozzle Body B
4. Spray tip E
5. Spray nozzle A

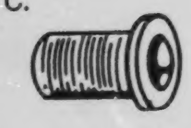
A.



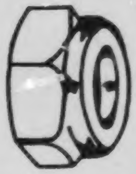
B.



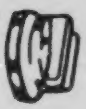
C.



D.

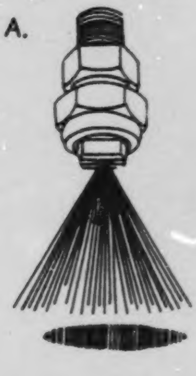


E.

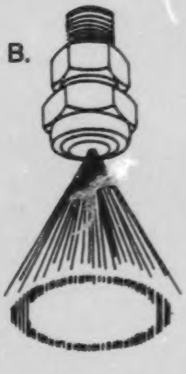


1. Regular Flat-Fan A
2. Even Flat-Fan C
3. Hollow Cone B
4. Flooding Flat-Fan D

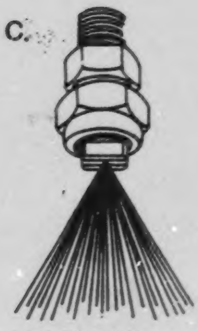
A.



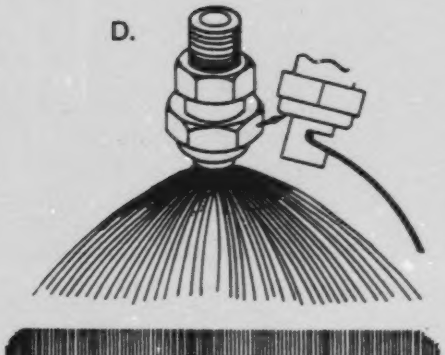
B.



C.



D.



PART VI. Problem:

Farmer Jones wants to apply 20 gallons of Amiben per acre. Jones will band the chemical over 10" of each 30" row while planting at 5 miles per hour. Find the rate per nozzle in gallons per minute.

$$\text{GPM} = \frac{20\times5\times10}{5940} = \frac{1000}{5940} = .168 \text{ gallons per minute}$$

UNIT H: AGRICULTURAL MECHANICS

PROBLEM AREA: MAINTAINING AND SERVICING TRACTORS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during late fall or early spring at the conclusion or beginning of field work seasons.

The estimated instructional time for this problem area is 15 to 20 days depending on how far the teacher wishes to go in developing the abilities necessary to perform maintenance and service skills. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-24-D-0362-466 with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, student worksheet, laboratory exercises, transparency discussion guide, and test questions were developed by Michael H. Rauch, Department of Vocational and Technical Education, University of Illinois. The art work in this problem area was prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture teachers:

Darrell Scherer - West Richland High School
Thomas Faulkner - Union High School
Donald Miller - New Holland High School
Paul Mealiff - Carthage High School
Frank Dry - Nashville High School
Clarence Benard - Enfield High School
Allan Ritter - North Clay High School

TEACHER'S GUIDE

I. Unit: Agricultural mechanics

II. Problem area: Maintaining and servicing tractors

III. Objectives: At the close of this problem area students will be able to:

1. Understand and maintain the basic engine systems.
2. State the importance of proper maintenance and safety procedures.
3. Find information concerning a particular tractor model.
4. Diagram 3 engine electrical systems.
5. Distinguish between and service the basic types of air filters.
6. Recognize a turbo charged engine.
7. Compare diesel and gasoline engine systems.
8. Name 2 types of cooling systems and service them.
9. Understand oil viscosity and SAE standards.
10. Determine proper tire inflation.
11. Perform basic competencies listed of tractor service and maintenance.

IV. Suggested interest approaches:

1. Discuss the importance of tractor efficiency with respect to the increase of world crop production.
2. Present pictures and sales brochures on a number of tractors and explain similarities in all power units.
3. Discuss the importance of preventive maintenance during peak busy seasons.
4. Have students discuss breakdowns in their home tractors and ask if preventive maintenance could have avoided the problem.

V. Anticipated problems and concerns of students:

1. How do I maintain a tractor?
2. Are all tractor engines the same? What are the differences?
3. What type of oil do I use?
4. How often do I check specific systems?

5. How long does antifreeze last? How much do I need.

6. What is the proper tire pressure?

7. Why are there no spark plugs on a diesel engine?

8. Where do I look for information about servicing and maintaining my tractor?

9. What parts need servicing?

10. When do I clean a part or replace it?

11. How do I keep water out of fuel systems?

12. How does antifreeze work?

VI. Suggested learning activities and experiences:

1. Question the class as to their personal experiences with maintenance at home, including tractors, trucks, cars, and lawnmowers.

2. Present a number of operator's manuals or request the students to bring them from home and discuss the information available in them.

3. Distribute the information sheets included in this problem area to give students a general background in each system.

4. Use the enclosed competency inventory to prepare students for employment. Have them evaluate themselves individually or as a group.

5. Bring a tractor into the shop and show the actual systems on that unit.

6. Show the transparencies included with the discussion of the engine systems to help clarify certain points.

7. Tour an implement dealership to get exposure to the problems and concerns that preventive maintenance addresses.

8. Suggest that students compare each system presented to a similar case from their home.

9. Have students complete the job sheets in relation to each topic. Suggest that they practice maintenance jobs at home or during their S.O.E.P.

10. Invite a local shop foreman to speak to the class about opportunities and requirements of industry.

11. Suggest to the students the possible opportunities in FFA contests relating to this topic.

12. Use the worksheets to evaluate the students progress.

VII. Application procedures:

1. Students should acquire knowledge and skills necessary to help on the farm, in future employment, or at home.

2. Students should apply these skills to their S.O.E.P.

3. This problem area should help agricultural mechanics students obtain industry employment.

4. This problem area should aid in FFA contest preparation.

VIII. Evaluation:

1. Prepare and administer a pencil and paper test on information presented.

2. Grade the worksheets completed by students.

3. Prepare and administer practical tests on part identification and system testing.

4. Grade students on lab participation.

IX. References and aids:

1. Vocational Agriculture Service, University of Illinois:

   a. VAS Unit 3024 "The Storage Battery."

   b. VAS Unit 3028 "The Ignition System."

   c. VAS Unit 3026 "The Spark Plug."

   d. VAS Unit 3030 "The Engine Cooling System."

   e. VAS Unit 3031 "Tires for Farm Equipment."

2. John Deere Fundamentals of Machine Operation, Preventive Maintenance, 2nd edition, available from Deere and Company, Moline, Illinois.

3. American Association for Vocational Instructional Materials, Tractor Maintenance, 4th edition, available from AAVIM, 120 Engineering Center, Athens, Georgia 30602.

4. Jacobs, Clinton O., and Harrell, William R., Agricultural Power and Machinery, McGraw-Hill Inc.

COMPETENCY INVENTORY

MAINTAINING AND SERVICING TRACTORS

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.

Competency	Circle One				
1. Establish a service record.	1	2	3	4	5
2. Identify the state of charge of a battery.	1	2	3	4	5
3. Diagram 3 engine electrical systems.	1	2	3	4	5
4. Identify parts of an ignition system.	1	2	3	4	5
5. Name 3 types of intake systems.	1	2	3	4	5
6. Clean and service dry type and oil bath air filters.	1	2	3	4	5
7. Clean sediment bowl.	1	2	3	4	5
8. Replace diesel fuel filters.	1	2	3	4	5
9. Test specific gravity of engine coolant.	1	2	3	4	5
10. Properly adjust fan belt tension.	1	2	3	4	5
11. Change engine oil and filter.	1	2	3	4	5
12. Determine the time to change oil.	1	2	3	4	5
13. Properly check and inflate tires.	1	2	3	4	5
14. Identify the parts of front wheel assemblies.	1	2	3	4	5
15. Check transmission fluid level.	1	2	3	4	5
16. Check hydraulic fluid level.	1	2	3	4	5
17. Read and follow operator's manual.	1	2	3	4	5
18. State proper refueling procedure.	1	2	3	4	5

These competencies outlined in the National Ag Occupations Competency Study, 1978, for entry level positions in agriculture.

Name ____________________ Date ____________________

INFORMATION SHEET #1

INTRODUCTION TO TRACTOR SERVICE AND MAINTENANCE

Sources: John Deere FMO Preventive Maintenance
AAVIM Tractor Maintenance

1. IMPORTANCE OF PREVENTIVE MAINTENANCE.

Preventive maintenance is service performed on a tractor at regular scheduled intervals. The main reasons to perform preventive maintenance are to: (a) reduce equipment failures and downtime, (b) keep equipment safe to operate, (c) save money in the form of higher efficiency. (Greater power and less fuel consumption)

2. IMPORTANCE OF SERVICE RECORDS.

Service records are necessary to keep on schedule in performing preventive maintenance. Your operators manual will recommend specific times for these services and this record should be kept near the tractor or in the service center. The American Society of Agricultural Engineers (ASAE) has established universal service recommendations for various machines.

3. IMPORTANCE OF AN OPERATOR'S MANUAL.

The operator's manual is the proper source of necessary information concerning a given tractor. It should tell you everything you need to know about operating and maintaining your tractor. Major mechanical damage can be incurred if the instructions are not followed according to the operator's manual. You should read and study it thoroughly before attempting to operate or maintain the tractor.

4. SAFETY.

Safety should always be first and foremost in everyone's mind. Let the tractor cool off and make sure it is shut off before you do any work on it. Be sure that your work area is well ventilated to remove harmful engine exhaust gases. After performing maintenance on a tractor, make sure all guards and shields are in place. Especially the PTO guard. Watch for any danger, warning, or caution signals while working near the tractor. Know the universal symbols to help identify tractor controls. The tractor should have a slow moving vehicle (SMV) emblem that is visible from the rear. Allow only one person on the tractor at a time. Be mentally alert and safety conscious at all times around machinery. Know first aid procedures in case of an accident. The operator's manual should outline the procedures for daily safety checks at the start of each day.

INFORMATION SHEET #2

ELECTRICAL SYSTEMS

Sources: JD, AAVIM, VAS 3024, 3026, 3028.

Assumption: Students have completed small engine unit.

1. BATTERY.

The battery is the source of electrical power. It should be kept fully charged at all times. The solution inside a battery is called electrolyte which is about 36% sulfuric acid and 64% water. To check the charge on a battery, use a hydrometer to measure the specific gravity of the electrolyte. Temperature plays an important part in measuring specific gravity. At 80°F, the hydrometer should read between 1.215-1.270. If not in that range, the battery should be recharged. For every 10° above or below 80°, you should add or subtract .004 gravity points, respectively.

If the electrolyte level is low, then add clean distilled water (if not available use clean rain water or soft water) to raise electrolyte to the proper level. Sealed batteries require no additional electrolyte. The plates in sealed batteries are made of lead-calcium which reduces gassing by as much as 97% over regular lead-antimony plates. Each cell in a battery produces about 2 volts of electricity. Therefore, a 6 volt battery has 3 cells while a 12 volt has 6 cells. The positive and negative posts are different diameters to help avoid connecting the battery with the current running backwards.

To clean a battery, use a solution of ¼ pound baking soda with 1 quart water. This will neutralize any acid that has formed. Wash the terminals and the surrounding area completely with the solution, then rinse with water. A battery which is dirty on top will slowly discharge.

Clean the posts and terminals when corrosion has built up on them. A wire brush cleaning tool is most effective because it is made for this specific purpose. Caution: Electrolyte is explosive and corrosive to most materials.

2. SYSTEMS.

There are 3 electrical systems on gasoline tractor engines: the starting system, the ignition system, and the charging system. The starting and charging systems are similar in gas and diesel engines, so we'll discuss those first.

STARTING SYSTEMS.

Starting systems include the battery, starter switch, solenoid, and starter. When the starter switch is turned on the solenoid engages the pinion into the flywheel and turns on the starter motor as well. Running the starter motor continuously for over 30 seconds will cause overheating and damage. Starter motors require little maintenance and if problems occur, the unit should be repaired by your authorized mechanic.

CHARGING SYSTEMS.

The charging systems include the battery, alternator/generator, regulator and ammeter. An alternator is used in A-C charging systems while the generator is used in D-C charging systems. The alternator or generator is turned by the fan belt and produces current to operate the other electrical systems and to recharge the battery. The regulator controls the current and keeps it at a safe level so as not to damage the other systems. The regulator also prevents overcharging of the battery. The ammeter measures the amount of current flow so the operator can monitor the charging system.

IGNITION SYSTEM.

The ignition system is only present on gasoline or other spark-ignition engines. Parts of the ignition system include the battery, ignition switch, coil, breaker points, condenser, distributor and spark plugs. The battery is the starting point of the ignition system.

When the ignition switch is turned on, current flows to the coil. The coil is made of two windings of wire that are called circuits. The primary circuit consists of a few (200-300) turns of relatively heavy wire. The secondary circuit consists of many (15,000-25,000) turns of a very fine wire. This circuit produces a large increase in voltage. The primary circuit produces up to 250 volts while the secondary circuit may go as high as 25,000 volts. The normal voltage output is between 5,000-10,000 volts which is what is required to jump a spark across the spark plug gap.

When the key is turned on the points are usually closed so the primary circuit goes straight through the points to the ground. This is how a battery can be discharged if the key is left in the "on" position. As the engine is started the breaker cam opens the points which stops the primary circuit flow and sends it to the condenser. The condenser absorbs the current of the primary circuit and thereby prevents an arc between the points. Without the condenser the points would burn rapidly. Stopping this flow of current collapses the magnetic field around the primary and secondary windings which induces a voltage in them. Because the secondary circuit is much higher voltage, it pushes that current out to the distributor cap and down to the rotor. The rotor inside the distributor cap turns to a spark plug terminal and directs the voltage to the correct plug. The current flows through the plug and jumps the gap which creates a spark to ignite the fuel mixture. The whole cycle is completed from 50-150 times per second depending on how fast the engine is running. The points and condenser should be serviced and maintained according to recommendations in the operator's manual or the small engine unit.

Spark plugs also need to be cleaned or changed periodically. Always be sure to gap a spark plug with a wire gauge before replacing it into an engine. Coils cannot be serviced and must be replaced when they fail. The distributor cap should be clean and free from corrosion. Any small cracks inside of a distributor cap will cause ignition problems and it should be replaced. The rotor should be free from corrosion. Timing an engine is accomplished by loosening the distributor and turning it back and forth until the timing marks line up with the impulses of a timing light. Your operator's manual should give further specifications about this procedure. VAS Unit 3026 goes into much greater detail about spark plugs and their operation.

Solid state ignition systems are the latest improvements on our engines. They eliminate the points and condenser and require no maintenance. Because of the no maintenance aspect of solid-state, it will probably be standard equipment in the future.

INFORMATION SHEET #3

INTAKE AND EXHAUST SYSTEMS

Sources: AAVIM, JD and Agricultural Power and Machinery

1. INTAKE SYSTEMS.

All engines must breathe air to operate. In gasoline engines, for every gallon of gas the engine uses 9000 gallons of air. A turbocharger increases the amount of air used, and diesel engines consume even more air per gallon of fuel. There are 3 types of intake systems: (1) natural aspirated, (2) turbocharged, and (3) turbocharged and intercooled. Most gasoline and smaller diesels are naturally aspirated. Natural aspirated engines draw or pull the air into the cylinder on the intake stroke. Turbochargers are exhaust driven turbines which force air into the combustion chamber, not to be confused with a belt driven blower which is usually used only on gasoline engines. Because of the greater amount of air more fuel can be added and power increased. Turbocharged and intercooled engines are used on larger tractors to increase power even more. Turbo's heat the air and the molecules expand. The intercooler cools that air to allow more molecules to be packed into the cylinder, thus allowing for more fuel and greater power.

2. TYPES OF AIR CLEANERS.

Air cleaners are necessary to keep dirt and other particles out of the engine. Without it an engine may last only a few hours before needing major mechanical repair. Air cleaners are usually of 2 forms: (1) oil-bath or (2) dry element.

Air cleaners may or may not have the added feature of a pre-cleaner. A pre-cleaner removes the larger particles of dirt and extends the service interval of the air-cleaner. To service the pre-cleaner, take off the cover and remove the bowl. Empty the dust, wipe the bowl clean, and replace bowl and cover.

Oil bath air cleaners were the first type of air cleaner developed and are common on most older equipment. Air is pulled through while dust particles are trapped by the oil. To clean an oil bath filter you need to loosen the clamp, remove the oil cup, and dump out oil, wipe out all caked-in dirt and clean the cup with solvent. Refill the cup with new engine oil to the "oil level" mark. Replace the cup and tighten the clamp. Be sure to use the proper oil as a lighter oil may be drawn into the engine and a heavier oil will decrease the filtering action. (Refer to operator's manual for interval of service.) Do not overfill the oil cup.

Most modern tractors have the dry element type of filter for better efficiency, less servicing, and the ability to be mounted in any position. (The dry filters are made of paper and/or foam.) Most dry type filters have a dust cup which removes the larger dust particles before getting to the filter itself. This cup should be checked daily. To service the dry element, wipe off the filter housing so no dirt accidentally enters the engine. Loosen the wingnut, clamp, or hand-screw which holds the dust cup and remove it and the filter. The filter may be tapped gently on a soft surface, low pressure compressed air may be blown outward to clean the pleats of paper (recommended not over 30 psi), or the element may be washed in water. If the element is washed it needs to dry thoroughly before being replaced (usually 24 hours). Do not wash the element in solvent. Be sure all seals are clean and free of dust before replacing the element and dust cup. Dry elements should be replaced periodically according to manufacturer's specifications.

3. EXHAUST SYSTEMS.

The muffler is the main component of the exhaust system. Mufflers carry away gases, reduce noise, and remove heat from engine exhaust. The two main types of mufflers are straight-through and reverse flow. Tractors usually have vertical mufflers and these openings need to be protected so water does not enter and damage the engine. No service is usually required on the muffler.

4. TURBOCHARGERS.

Turbochargers are used because they increase power. They require little or no maintenance but they should be cared for properly. Turbochargers turn at a very high speed (40,000-130,000 rpm) and consequently get very hot. The engine should idle for a few minutes before shut down to allow the turbocharger to cool. If the engine has not run for several weeks, it should be turned over with the starter until oil pressure develops, then the fuel shut-off control (kill switch) should be pushed in to start. (Don't operate starter over 30 seconds at a time.) Periodically inspect mountings and connections to the turbocharger to prevent air and oil leakage.

INFORMATION SHEET #4

FUEL SYSTEMS

Sources: JD, AAVIM, Jacobs

1. FUELS

Diesel fuel is the most commonly used fuel in tractors today. Gasoline is used in older tractors and most other vehicles in agricultural businesses. LP-gas use is becoming less popular and it will not be discussed in depth in this section.

2. DIESEL

Diesel fuels are measured by cetane number which is the ability or speed of spontaneous ignition combustion. The higher the cetane number the easier a diesel will start. Diesel fuel should ignite early and burn evenly. Diesel fuels are graded into #1 diesel fuel--a volatile fuel used where frequent load changes occur and is recommended for extremely cold temperatures--and #2 diesel fuel--a low voiatility fuel used in engines with heavy loads and more uniform speeds.

Diesel fuel systems are more complex than gasoline systems. They include the tank, pump, filter, injection pump and injectors. The tank should be kept clean and free of dirt and water. These impurities can do major damage to the injection system, so the filters are very important. The operator's manual will show the proper method and time to change your fuel filter. Generally, you should shut off fuel from the tank, bleed fuel from the filters (if it has a drain), remove the filter and replace with a new one. Replace the drain plug or bleeder and reopen the fuel valve from the tank. Before restarting the engine make sure the air is bled from the system. Bleeding valves are usually on top of the filter and you open that valve until fuel comes out and the air is removed. Some tractors are equipped with hand priming pumps to pump fuel into the filter until all air is removed. Injection pumps and injectors should be serviced at your local dealer. These are precision instruments and require some special equipment and expertise to be serviced properly.

3. GASOLINE

Gasoline is measured by octane number which is the ability to resist detonation. Gasoline should burn slowly to resist knocking. Cetane and octane are opposite properties. Most gasoline farm tractors use regular gas which has an octane rating between 88-94. The gasoline system includes the tank, sediment bowl, and carburetor. A fuel pump may be used if the carburetor is above the fuel tank outlet.

Again, it is important to keep the fuel tank clean. Sediment bowls should be checked daily and serviced whenever necessary. To service a sediment bowl, shut off the fuel from the tank and loosen the jam nut on the bottom. Remove the bowl itself and the strainer at the top and clean them in solvent. Open the fuel valve and observe the fuel to make sure it is clean and flowing properly. Replace the strainer and bowl and retighten them with the jam nut. Open the fuel valve and check for leaks.

4. DIFFERENCES AND SIMILARITIES

The basic difference between diesel and gasoline engines is the way they mix air and fuel. In a diesel, the air is pulled into the combustion chamber and the fuel is injected into the compressed air. The heat from compression (16:1) is great enough to ignite the fuel. In a gasoline engine the air and fuel are mixed in the carburetor and pulled together into the combustion chamber. The compression (8:1) is not high enough for spontaneous combustion and a spark plug is used to ignite the mixture.

Both systems need clean, water free, fuel. Tractor fuel tanks should be filled at the end of the day to avoid condensation inside the tractor tanks. Moisture should be drained from above ground tanks annually. Underground tanks should be checked periodically to be sure they have not developed a leak.

INFORMATION SHEET #5

COOLING SYSTEMS

Sources: JD, AAVIM, VAS 3030

A cooling system is necessary to prevent overheating and regulate engine operating temperature. The two basic systems in use today are air-cooled and water-cooled. Air-cooled engines operate on the same principle as lawnmowers and motorcycles. Air moves around cooling fins and carries the heat away. To maintain an air-cooled system you must keep the cooling fins clean and free of dirt and chaff.

The water-cooled or liquid-cooled systems are more complicated. They include a radiator with cap, water pump, fan, fan belt, thermostat, hoses, and coolant. The radiator is the main reservoir for coolant and it is here that the heat is removed by air being pulled through the cooling core. The core must be kept clean and free from dirt and obstructions to work properly. The radiator cap is pressurized to raise the boiling point of the coolant. This allows the engine to operate at higher temperatures without boiling the coolant. The water pump is responsible for circulating the coolant through the engine and radiator. The thermostat controls the amount of coolant which is circulated through the radiator. As the coolant reaches operating temperature in the block, the thermostat will open and allow circulation of cooler liquid. The thermostat thereby regulates the temperature of the engine. The fan which is usually connected to the water pump is turned by the fan belt, which is driven by the engine crankshaft. The fan is responsible for pulling cold air through the radiator. The belt tension should be monitored rather closely to be sure the fan and water pump keep turning. Check your operator's manual to attain the proper belt tension and how to make necessary adjustments.

The coolant is the most important part of the system. Antifreeze is added to water for a number of reasons. It lowers the freezing point of water, provides rust and corrosion inhibitors, and raises the boiling point of water. Antifreeze and water are usually mixed half and half in the cooling system. The coolant should be tested periodically to assure proper protection for the engine. A hydrometer is used to test antifreeze, but temperature makes a difference in the readings; so, be sure to adjust the reading accordingly. There are two types of antifreeze, alcohol and ethylene glycol (permanent). Alcohol has a 180° boiling point which is below many engine operating temperatures, therefore it is not usually recommended. Ethylene glycol is recommended because of its high boiling point of 223°. It is called permanent antifreeze because water will boil away before the ethylene glycol will boil. Permanent does not mean, in this case, that the antifreeze will last forever. The coolant must be checked and even replaced periodically.

INFORMATION SHEET #6

LUBRICATION SYSTEMS

Sources: JD, AAVIM

Engine oils are necessary to protect moving parts from friction and wear, to cool them, and to keep them clean. There are a wide variety of oils available for many different applications.

1. VISCOSITY

Viscosity is the ability of oil to flow at a given temperature. The Society of Automotive Engineers (SAE) has determined the standards of viscosity by which an oil should be classified. Your operator's manual will list the recommended oil to use in your tractor. The American Petroleum Institute (API) has developed performance standards which they call service classifications. The API rating determines the quality of oil for use in different engines. A car, for example, would use a different quality oil than a late model diesel tractor.

2. SERVICE

Maintaining the lubrication system is one of the most important parts of preventive maintenance. Tractor manufacturers recommend that the oil be changed every 100 hours of operation. Most oil changes should include changing the oil filter. The engine should be warmed up to operating temperature so the oil flows more freely. Shut off the engine and drain the crankcase completely. Some drain plugs are magnetic to attract metal filings. These chips or filings should be wiped off before the plug is replaced. While the crankcase is draining you should change the oil filter. With a "spin-on" filter, you spin-off the old filter, lubricate the gasket on the new filter and spin it on. When the gasket contacts the base turn filter one half turn. (Do not overtighten.) Check the operator's manual for older tractors. Usually, you remove the filter bowl or canister, replace the filter element, and replace the bowl or canister. Install the drain plug and fill the crankcase with the proper amount of recommended oil. Check the dipstick and be sure not to overfill the crankcase. Start the engine and let it idle until oil pressure is achieved, and check the system for any leaks, especially at the oil filter and drain plug.

3. OIL PRESSURE

Oil pressure is provided by the oil pump and is monitored by an oil pressure gauge or a warning light on the instrument panel. Never operate an engine without satisfactory oil pressure as major mechanical damage can occur. If oil pressure is abnormally low or high, your local dealer should be consulted.

SAE Letter Designation	API Identification and Engine Service Description
SA	Utility Gasoline & Diesel Engine Service Service typical of engines operated under such mild conditions that the protection afforded by compounded oils is not required. This classification has no performance requirements.
SB	Minimum Duty Gasoline Engine Service Service typical of engines operated under such mild conditions that only minimum protection afforded by compounding is desired. Oils designed for this service provide only anti-scuff capability and resistance to oil oxidation and bearing corrosion.

SC	1964 Gasoline Engine Warranty Service Service typical of gasoline engines in 1964 through 1967 models of passenger cars and trucks. Oils designed for this service provide control of high and low temperature deposits, wear, rust and corrosion in gasoline engines.
SD	1968-71 Gasoline Engine Warranty Service Service typical of gasoline engines in passenger cars and trucks beginning with 1968 models. Oils designed for this service provide more protection from high and low temperature engine deposits, wear, rust and corrosion in gasoline engines than oils for API Service Classification SC and may be used when oils for API Service Classification SC are recommended.
SE	1972 Gasoline Engine Warranty Service
SF	1980 Gasoline Engine Warranty Service
CA	Light Duty Diesel Engine Service Service typical of diesel engines operated in mild to moderate duty with high quality fuels. Oils designed for this service were widely used in the late 1940's and 1950's. These oils provide protection from bearing corrosion and from high temperature deposits in normally aspirated diesel engines.
CB	Moderate Duty Diesel Engine Service Service typical of diesel engines operated in mild to moderate duty, but with lower quality fuels which necessitate more protection from wear and deposits. Oils designed for this

	service were introduced in 1949. Such oils provide necessary protection from bearing corrosion and from high temperature deposits in normally aspirated diesel engines with higher sulfur fuels.
CC	Moderate Duty Diesel & Gasoline Engine Service Service typical of lightly supercharged diesel engines operated in moderate to severe duty and has included certain heavy-duty, gasoline engines. Oils designed for this service were introduced in 1961 and used in many trucks and in industrial and construction equipment and farm tractors. These oils provide protection from high temperature deposits in lightly supercharged diesels and also from rust, corrosion and low temperature deposits in gasoline engines.
CD	Severe Duty Diesel Engine Service Service typical of supercharged diesel engines in high-speed, high-output duty requiring highly effective control of wear and deposits. Oils designed for this service were introduced in 1955 and provide protection from bearing corrosion and from high temperature deposits in supercharged diesel engines when using fuels of a wide quality range.

INFORMATION SHEET #7

TIRES AND WHEEL BEARINGS

Sources: JD, AAVIM, VAS 3031

1. TIRES.

Proper inflation should be maintained at all times to insure long life and proper service. A low pressure gauge should be used to get an accurate reading. If there is liquid in the tire a special liquid-type pressure gauge must be used. Underinflation can cause stress cracks on sidewalls, excessive tread wear on sides (cupping), twisted or broken valve stems, difficult steering, tire slipping on rim. Overinflation causes excessive wear on center of tread, greater tire slippage, rougher ride, easier fabric damage from sharp impact. Regular inflation checks are the best way to insure efficient tire performance. VAS Unit 3031 goes into great detail concerning tires for farm equipment.

2. GREASING TRACTORS AND WHEEL BEARINGS.

Consult the operator's manual for the location of the grease fittings on your tractor. Use grease as recommended by the manufacturer, and follow the lubrication service schedule. When you use a grease gun, you should wipe the grease fitting to remove the dirt. Place the gun on the fitting and hold it in line, push it on, pump slowly. If the bearing is sealed, do not force the grease in as it may destroy the seal and allow dirt to enter. If the bearing has no seal, pump the gun until the old grease is forced out. This will insure lubrication in the bearing. Remove the gun by turning it to the side and wipe off excess grease.

Front wheel bearings need to be repacked with grease periodically. (Refer to diagram for parts of a wheel assembly.) Remove the hub cap, cotter pin and adjusting nut. You should be able to remove the thrust washer and outer bearing. Shake the wheel if not loose and pull it off the spindle. The inner bearing should be available on the spindle or in the hub. Clean the bearings in solvent and spin them to get the dirt deposits out. Clean the bearing cups and the hub and hub cap. Dry the bearings thoroughly and repack them according to instruction in operator's manual. Apply a coat of wheel bearing grease to the bearing cones and the hub. Assemble parts in reverse order, tighten adjusting nut until you're sure the bearings are seated properly. Loosen the nut until the wheel turns easily and retighten until there is a slight drag. The operator's manual may have a specific torque for the adjusting nut. Align the slot in the nut with the hole for the cotter pin and install it. For further recommendations see your operator's manual.

INFORMATION SHEET #8

HYDRAULICS AND POWER TRAINS

HYDRAULICS AND POWER TRAINS.

Your operator's manual will show how and where to check the tractor hydraulics and transmission. Late model tractors have a common reservoir for the transmission and hydraulic fluid. Special fluids have been developed by the major manufacturers for their own tractors. Hydraulic systems perform the majority of external functions of a tractor including assisting the steering and brakes, lifting or lowering mounted implements, operating remote cylinders, and driving hydraulic motors. Hydraulic systems get quite complex and service should be performed by a qualified mechanic. For preventive maintenance purposes we need to know how to change the fluid and filters. Your operator's manual will help you locate the drain plug and the filter. Remove the drain plug and filter. Install the new filter, clean and replace the filter cover, and drain plug. Refill the reservoir to the proper level with the appropriate fluid. Start the engine and operate the system through its working cycle to bleed the air out. (Hydraulic steering and brakes may need to be bled separately. See your operator's manual.) Clean and visually inspect lines, hoses, and couplings for leakage or wear to prevent field breakdowns. Dirt is the major cause of hydraulic problems.

STUDENT WORKSHEET #1

INTRODUCTION TO TRACTOR SERVICE AND MAINTENANCE

1. Why do we have preventive maintenance?

   a.

   b.

   c.

2. What is the best source of information on a given tractor?

3. What are some services recommended at the

   a) 10 hour interval
   1. ______
   2. ______
   3. ______

   b) weekly interval
   1. ______
   2. ______
   3. ______

   c) 100 hour interval
   1. ______
   2. ______
   3. ______

   d) 250 hour interval
   1. ______
   2. ______
   3. ______

   e) annual interval
   1. ______
   2. ______
   3. ______
   4. ______

STUDENT WORKSHEET #2

ELECTRICAL SYSTEMS

1. What is a battery?

2. Diagram and label the starting system.

3. Diagram and label one of the charging systems.

4. List the components of an ignition system.

   a)

   b)

   c)

   d)

   e)

   f)

   g)

5. When the breaker points open, which circuit does the current flow through?

6. Diagram the circuit in question 5.

STUDENT WORKSHEET #3

INTAKE AND EXHAUST SYSTEMS

1. Indicate which system each part belongs with.

E = Exhaust   I = Intake   N = None   B = Both

a. oil-bath ________   d. turbo charger ________

b. pre-cleaner ________   e. dry type ________

c. reverse flow ________   f. spark plug ________

2. Why do we use turbo chargers?

3. Turbos are driven by a belt. (True/False) ________________________

4. Name 2 types of mufflers.

____

____

5. What type of air filters are on most automobiles?

STUDENT WORKSHEET #4

FUEL SYSTEMS

1. Name 3 types of fuel used on the farm.

   a)

   b)

   c)

2. How are diesel fuels rated?

3. List 5 parts of a diesel fuel system.

   a)

   b)

   c)

   d)

   e)

4. How is gasoline rated?

5. Diagram a gasoline fuel system.

STUDENT WORKSHEET #5

COOLING SYSTEMS

1. What is the purpose of the cooling system?

2. Name 3 examples of air-cooled engines.

   a)

   b)

   c)

3. What controls coolant circulation?

4. Where is coolant cooled?

5. What is the purpose of antifreeze?

6. Does a hydrometer always give a correct reading? Why?

7. List some reasons for using a pressure type radiator cap?

   a)

   b)

   c)

8. Diagram and label a cooling system.

STUDENT WORKSHEET #6

LUBRICATION SYSTEMS

1. List 3 reasons why oils are necessary.

   a)

   b)

   c)

2. What is viscosity?

3. What does SAE represent?

4. What is the recommended time between oil changes?

5. What is the service description of an SE designation?

6. Why must oil be changed?

STUDENT WORKSHEET #7

TIRES AND WHEEL BEARINGS

1. List some results of improper tire inflation.

Overinflation 1)

2)

3)

Underinflation 1)

2)

3)

2. What type of gauge should be used on large tires?

3. Where do you find grease fittings and recommend greasing intervals?

4. How often should front wheel bearings be repacked?

STUDENT WORKSHEET #8

HYDRAULICS AND POWER TRAINS

1. What are some functions of a hydraulic system?

    a)

    b)

    c)

2. What two systems use the same fluid?

3. What is the major cause of hydraulic breakdowns?

4. What other system resembles the hydraulic system in terms of periodic servicing?

JOB SHEET #1

ELECTRICAL SYSTEMS

Objectives:

1. To determine the state of electrical charge in a storage battery.
2. To inspect a distributor cap, points, and condenser.
3. To inspect and gap spark plugs.

Materials:

1. Gasoline powered tractor (any spark ignition engine)
2. Hydrometer
3. Spark plug wrench
4. Wire feeler gauge
5. Screwdriver

Procedures:

1. Remove battery caps, insert hydrometer and extract electrolyte.
2. Take hydrometer reading and determine by the amount of specific gravity the state of charge.
3. Replace battery caps and move to distribution cap.
4. Use screwdriver to pry off the clamps holding the distributor cap.
5. Visually inspect distributor cap, points, and rotor for corrosion or pitting.
6. Replace distributor cap.
7. Remove spark plugs with spark plug wrench.
8. Clean the plugs and gap to proper specifications.
9. Replace spark plugs.

Observations:

1. Can you name the parts of the electrical system?
2. Can you check a battery and gap a spark plug?

Application:

How could this exercise help at home or on your S.O.E.P.?

Optional Activities

1. Tune-up engine.

JOB SHEET #2

INTAKE AND EXHAUST SYSTEMS

Objective: To be able to service air filters.

Materials:

1. Solvent and rags
2. 30 psi air hose
3. Dry type air filter
4. Oil bath air filter

Procedures:

1. Remove dry type filter from housing.
2. Tap on soft surface and rotate it slowly.
3. Blow compressed air from the inside out.
4. Wipe off excess dust and replace filter.
5. Loosen clamp and remove oil bath filter cup.
6. Dump out oil and wipe sludge from cup.
7. Clean the oil cup with solvent and dry thoroughly.
8. Refill oil cup to "oil level" mark.
9. Replace oil bath cup and tighten clamp.

Observations:

1. How much dirt was removed by tapping and blowing compressed air through filter?

2. How thick was sludge in oil bath or how dirty was the oil?

JOB SHEET #3

FUEL SYSTEMS

Objective: To service fuel filtering parts.

Materials:

1. Fuel tank with sediment bowl
2. Solvent and rags
3. Diesel fuel system with filters
4. New fuel filter (for your tractor)
5. Pliers

Procedures:

Part One

1. Shut off gasoline fuel supply at tank.
2. Take pliers and loosen jam nut.
3. Swing bail to the side and remove bowl.
4. Clean out bowl and screen.
5. Replace screen, gasket, bowl, and bail.
6. Tighten jam nut and open fuel; check for leaks.

Part Two

1. Shut off diesel fuel supply.
2. Drain filter (if possible) and remove it.
3. Clean filter bowl (if not self contained).
4. Install new filter and replace bowl.
5. Close drain plug and open fuel supply.
6. Bleed air from top of bowl until just fuel comes out.
7. Close bleeder valve; check for leaks.

Observations:

1. Notice the different color of sediment bowl when clean.

2. How would dirt affect operation of machine?

3. Does power increase with new filter?

Applications:

1. How can this exercise help at home?

2. How can this improve S.O.E.P. skills?

JOB SHEET #4

COOLING SYSTEMS

Objectives:

1. To test antifreeze protection.
2. To properly adjust fan belt.
3. To test a thermostat. (Optional)

Materials:

1. Cooling system
2. Hydrometer (temperature correction chart)
3. Set of wrenches
4. Rule
5. Thermostat (optional)
6. Thermometer to 220°, water pot, and heat source (optional)

Procedures:

1. Remove radiator cap.
2. Remove sample of antifreeze and take the reading and adjust fo temperature.
3. Replace antifreeze and radiator cap.
4. Measure fan belt tension with rule.
5. Loosen generator or alternator and adjust belt to proper tension.
6. Retighten generator or alternator and double check belt tension.
7. Put thermostat in water and heat. (optional)
8. Record at what temperature it opens. (optional)

Observations:

1. Was the antifreeze good enough for winter in your area?
2. Was your fan belt adjusted properly?
3. Did the thermostat open at the indicated temperature?

Application:

1. How can this exercise be used at home?
2. How does it relate to your S.O.E.P.?

JOB SHEET #5

LUBRICATION SYSTEMS

Objective: To change engine oil and filter.

Materials:

1. Tractor or engine and oil filter
2. New oil filter (for your engine)
3. Set of wrenches and shop rag
4. Basin to catch used oil
5. New oil (recommended by manufacturer)

Procedures:

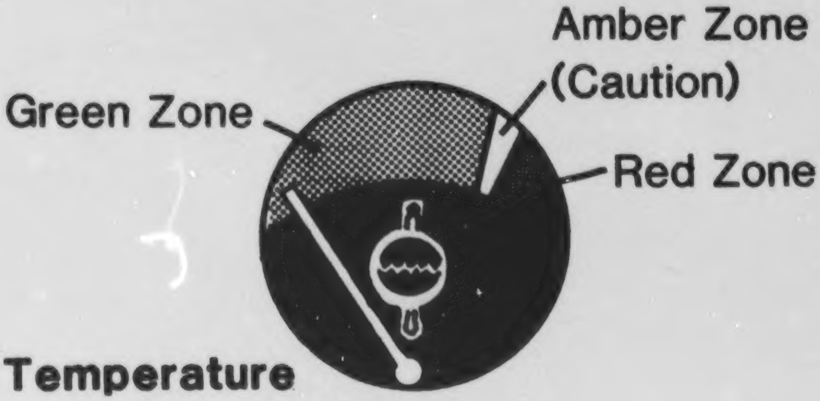
1. Take a wrench and remove drain plug in oil pan.
2. While oil is draining, remove old filter.
3. Wipe filter area clean.
4. Install new filter and wipe up excess oil.
5. After oil is drained, replace plug.
6. Refill oil reservoir with proper amount of recommended oil.
7. Start engine, check oil pressure, and check for leaks.

Observations:

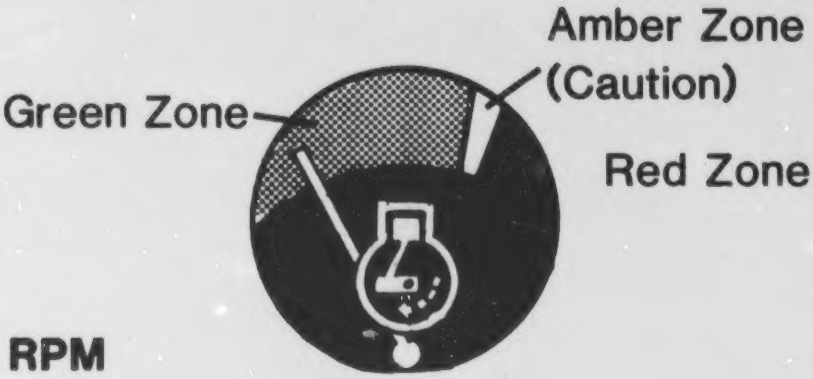
1. Was there any sludge or metal on bottom of oil pan or plug?

2. Was oil changed at the proper interval?

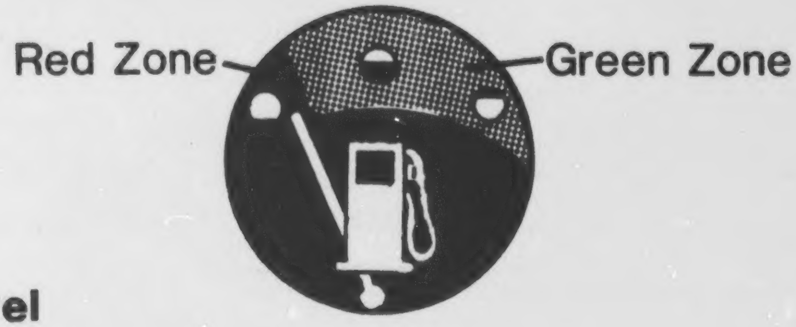
UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: DASHBOARD GAUGES


Amber Zone (Caution)
Green Zone
Red Zone

Water Temperature


Amber Zone (Caution)
Green Zone
Red Zone

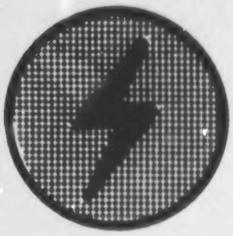
Engine RPM


Red Zone
Green Zone

Fuel Level

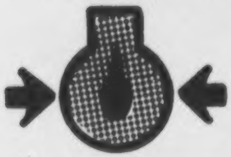
UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: DASHBOARD GAUGES (Continued)

Red When Charge
Rate Insufficient



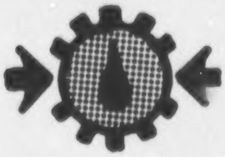
**Ammeter or
Alternator Light**

Red When Pressure
Is Insufficient



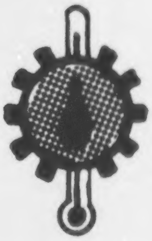
**Engine
Oil Pressure**

Red When Pressure
Is Insufficient

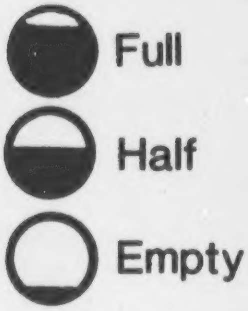


**Transmission
Oil Pressure**

Red
When Temperature
Is Too High

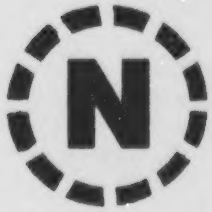


**Transmission
Oil Temperature**

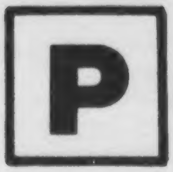


Volume Level

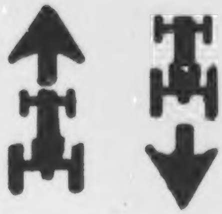
UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: OPERATIONAL CONTROLS



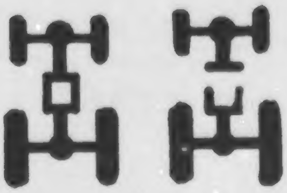
NEUTRAL



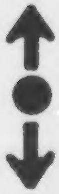
PARK



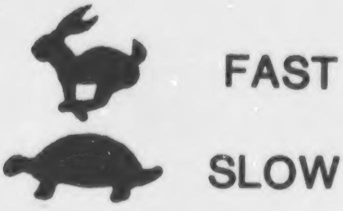
FORWARD/REVERSE



AXLE
CONNECT/DISCONNECT

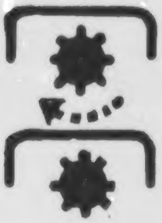


LEVER DIRECTION

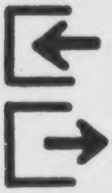


SPEED RANGE

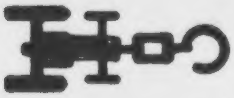
UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: OPERATIONAL CONTROLS (Continued)



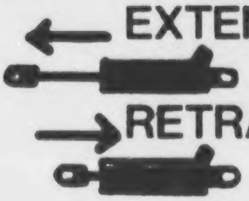
POWER TAKEOFF


ENGAGE OR IN
DISENGAGE OR OUT

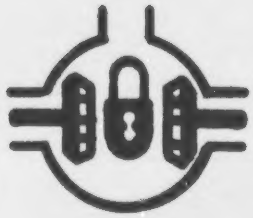
CONNECTION



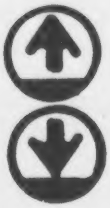
TOW


EXTEND
RETRACTED

REMOTE CYLINDER

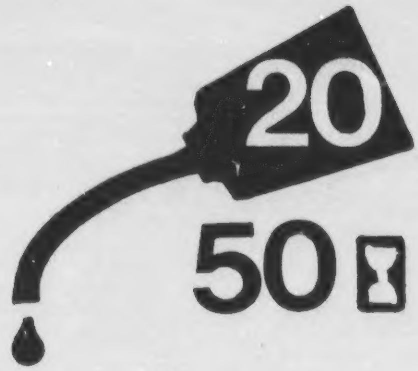


DIFFERENTIAL LOCK

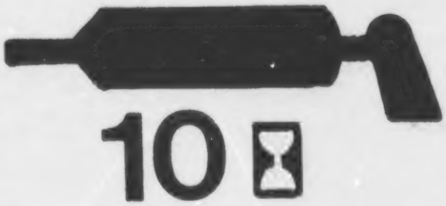


IMPLEMENT MOVEMENT

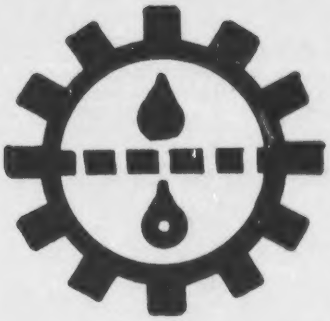
UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: SERVICING SYMBOLS



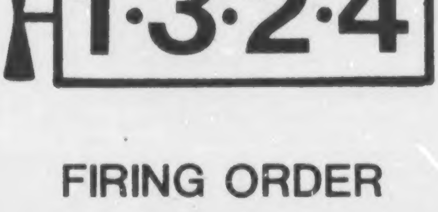
OIL TYPE AND FREQUENCY



GREASE
LUBRICANT
FREQUENCY

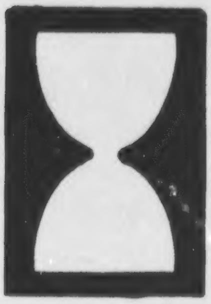


TRANSMISSION
OIL FILTER

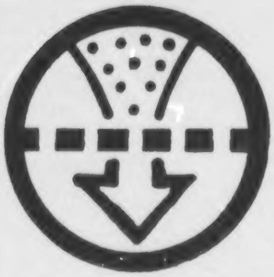


FIRING ORDER

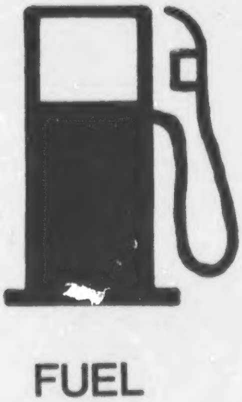
UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: SERVICING SYMBOLS



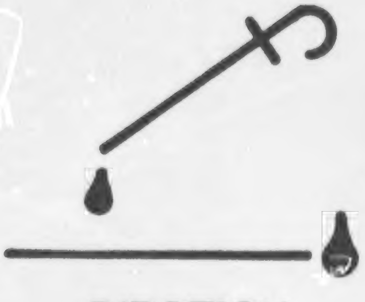
HOURS



AIR FILTER

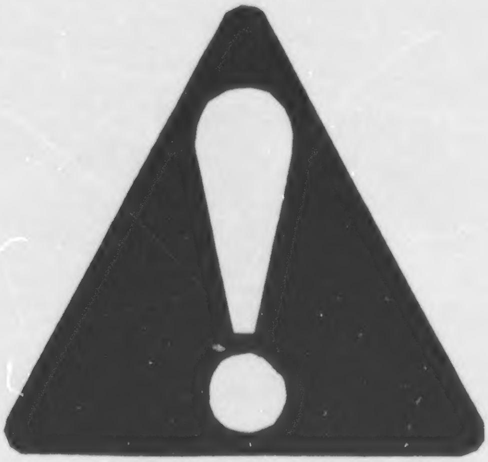


FUEL

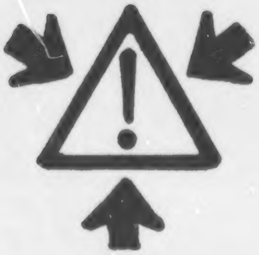


DIPSTICK
OIL LEVEL

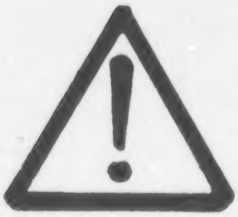
UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: SAFETY ALERT



SAFETY ALERT

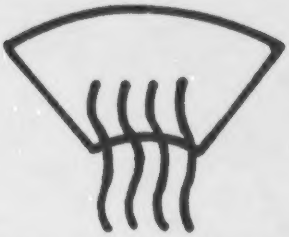


PRESSURIZED
OPEN SLOWLY

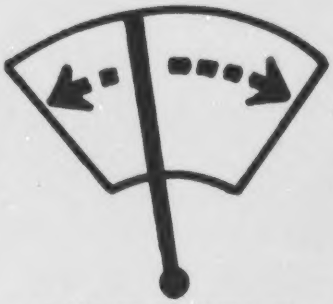


CAUTION

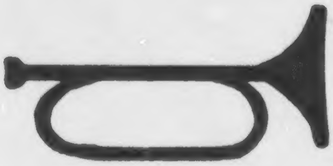
UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: DASHBOARD CONTROLS



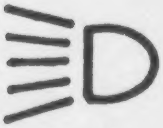
WINDSHIELD
DEFROSTER



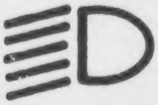
WINDSHIELD
WIPER



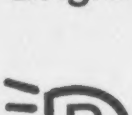
HORN



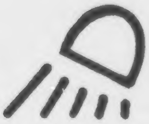
Bright



Dim



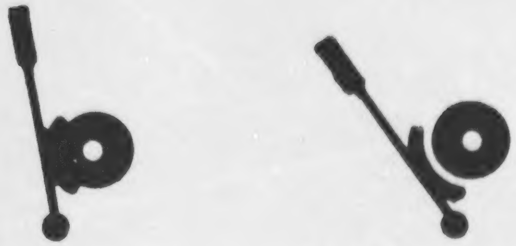
Park



Work light

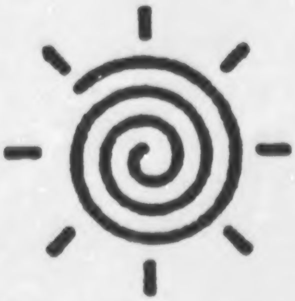
LIGHTS

UNIVERSAL CONTROL AND INSTRUMENT SYMBOLS: DASHBOARD CONTROLS (Continued)

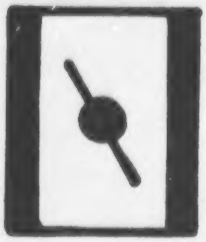


Engaged Disengaged

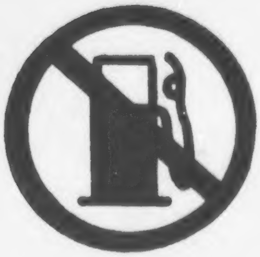
HANDBRAKE



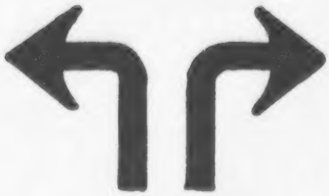
CIGARETTE LIGHTER



CHOKE



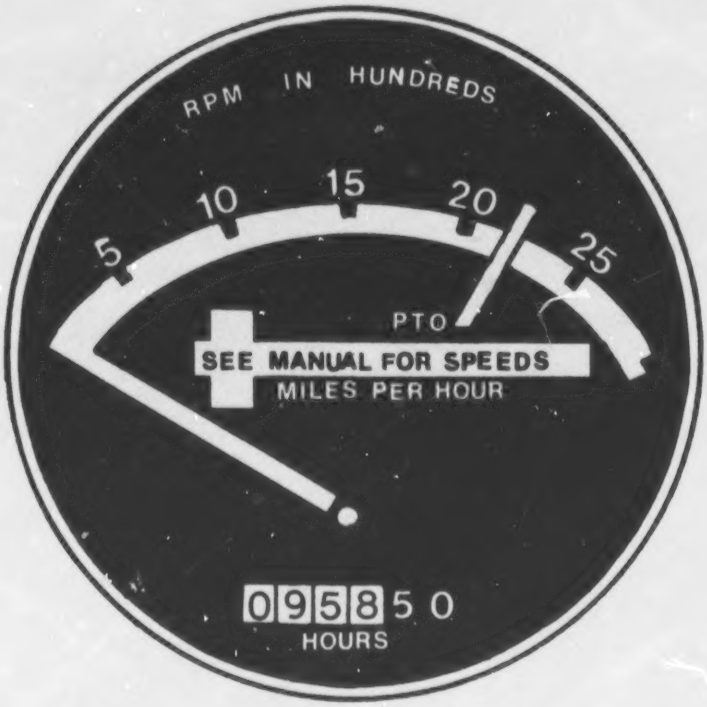
FUEL SHUTOFF

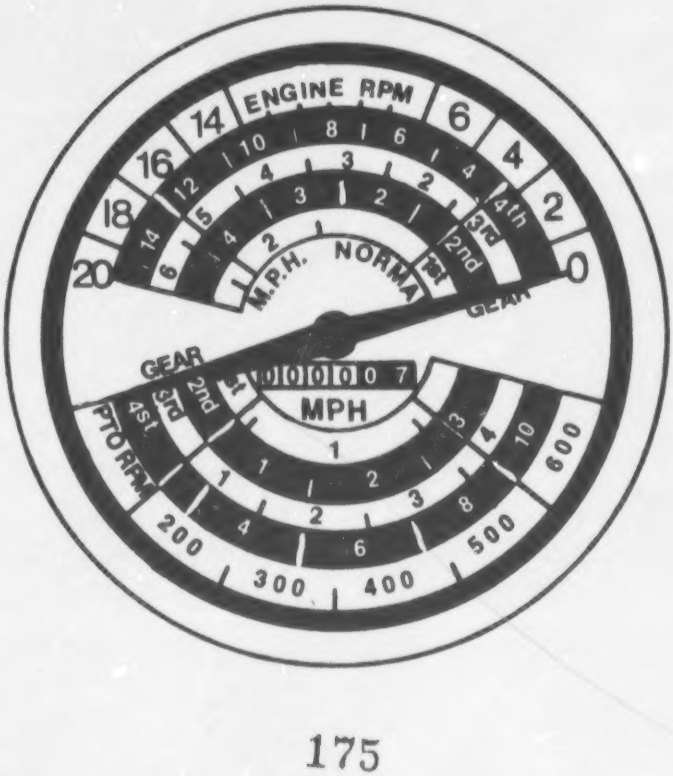


Left Right

TURN SIGNALS

HOUR METERS DETERMINE SERVICE INTERVALS


RPM IN HUNDREDS
5
10
15
20
25
PTO
SEE MANUAL FOR SPEEDS
MILES PER HOUR
0958 5 0
HOURS


ENGINE RPM
20
18
16
14
6
4
2
0
M.P.H. NORMAL
1st
2nd
3rd
4th
GEAR
GEAR
000000 7
MPH
1st
2nd
3rd
4st
PTO RPM
200
300
400
500
600

TRACTOR MAINTENANCE: DAILY OR 10 HOUR SERVICE

1. Check oil level and add oil if low.

2. Clean air filter if in dirty conditions
   (not required in normal conditions).

3. Visually inspect entire machine
   for leaks and broken, bent, or loose parts.

4. Fuel the unit at the end of the working day.

TRACTOR MAINTENANCE: WEEKLY OR 50 HOUR SERVICE

1. Check coolant level. If low, check for leaks and refill.
2. Check battery. Make sure the electrolyte is at the proper level and at the proper state of charge.
3. Check fan belt tension and adjust if necessary.
4. Service air filter (dry type).
5. Lubricate chassis, grease tie rod ends and steering mechanisms, clutch throw-out bearings.
6. Check hydraulic fluid level.
   If low, check for leaks and fill to proper level.

TRACTOR MAINTENANCE:
BIWEEKLY OR 100 HOUR SERVICE

1. Change crankcase oil and filter.
2. Clean crankcase breather.
3. Visually inspect generator or alternator for signs of excessive wear.
4. Visually inspect starter. Replace worn wires and tighten loose connections.
5. Lubricate clutch and brake pedals.
6. Check power steering fluid level.
7. Check tire pressure.

TRACTOR MAINTENANCE: SEASONAL OR 250 HOUR SERVICE

1. Clean and gap spark plugs,and change if necessary.
2. Clean sediment bowl.
3. Clean and gap the points.
4. Adjust clutch.
5. Adjust brakes.
6. Check transmission fluid and final drives.
7. Check valve clearance.
8. Adjust carburetor.
9. Service air cleaner (oil bath type).
10. Clean battery.

TRACTOR MAINTENANCE:
ANNUAL OR 500-1000 HOUR SERVICE

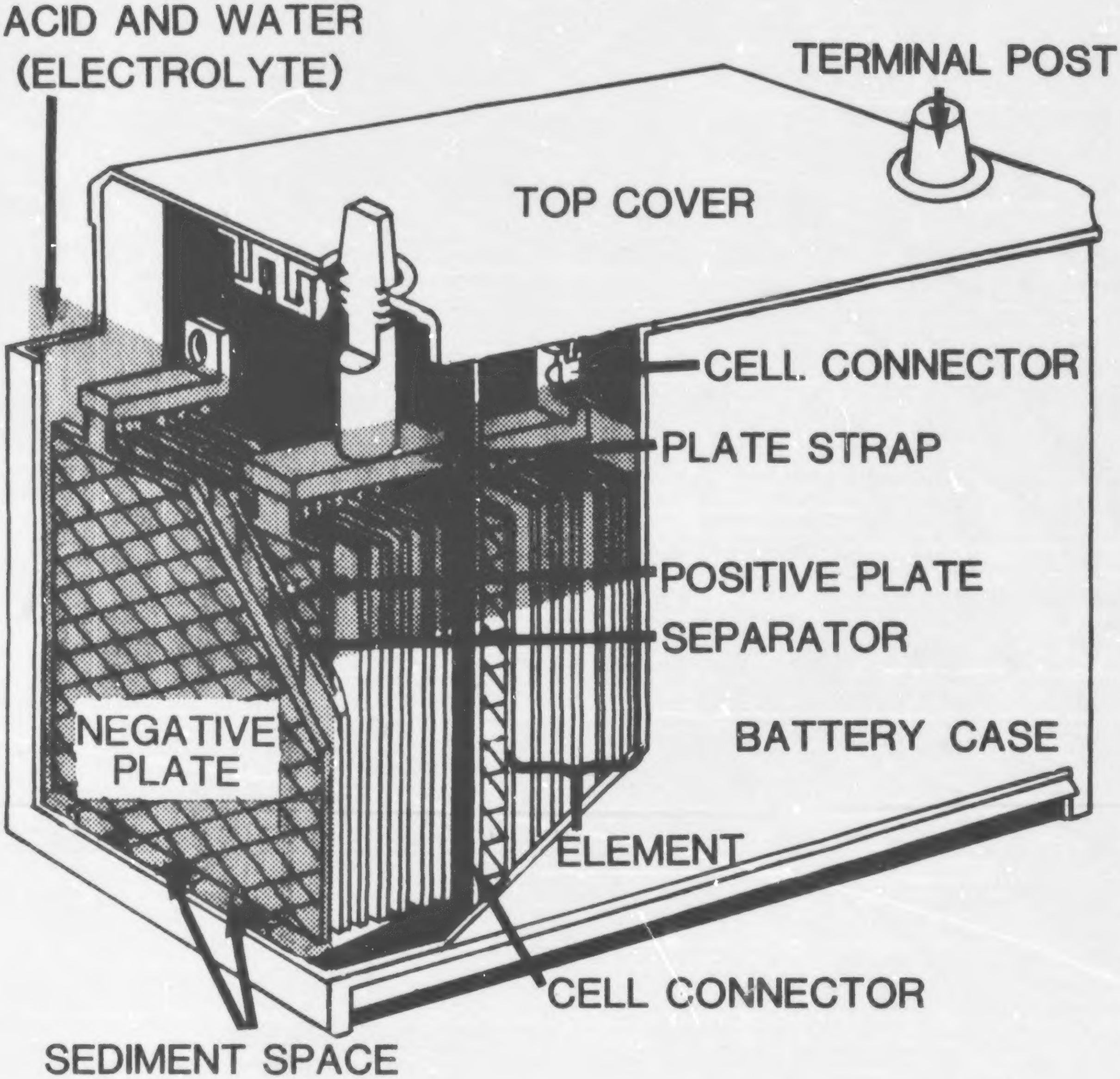
1. Change fuel filter on diesel engine.
2. Check distributor. Tune up if necessary.
3. Check timing.
4. Lubricate front wheel bearings.
5. Clean and flush cooling system (1000 hours).
6. Clean starter, alternator, or generator.
7. Clean entire tractor.
8. Store tractor properly.
9. Change hydraulic and transmission fluid and filters (1000 hours).
10. Adjust the governor.

SERVICE SCHEDULE FOR TRACTOR

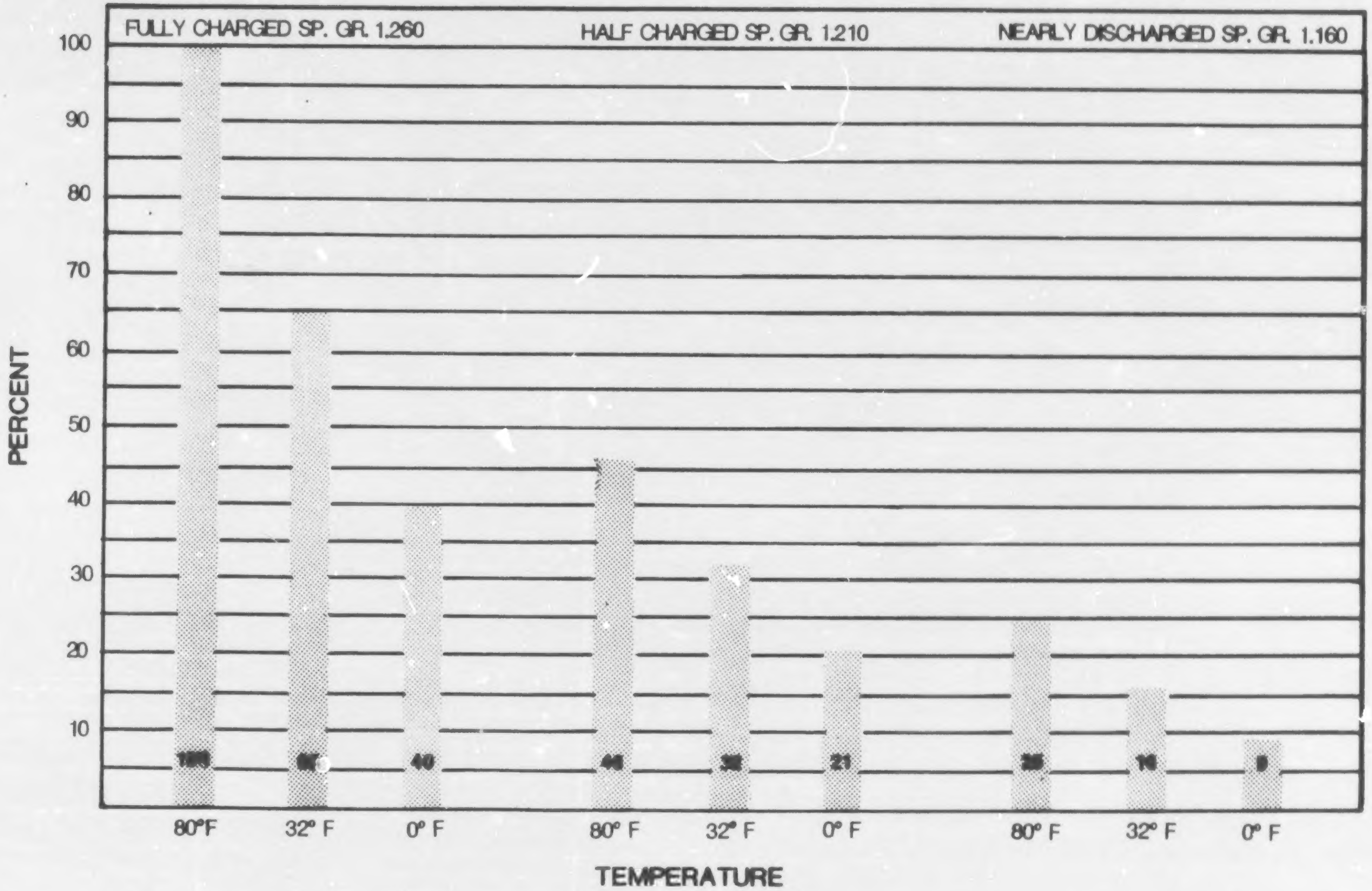
DATE AND HOUR –METER READING:________

DATE OF SERVICE	50 HRS.	100 HRS.	250 HRS.	500–1000 HRS.	OTHER

PARTS OF A MAINTENANCE-FREE BATTERY

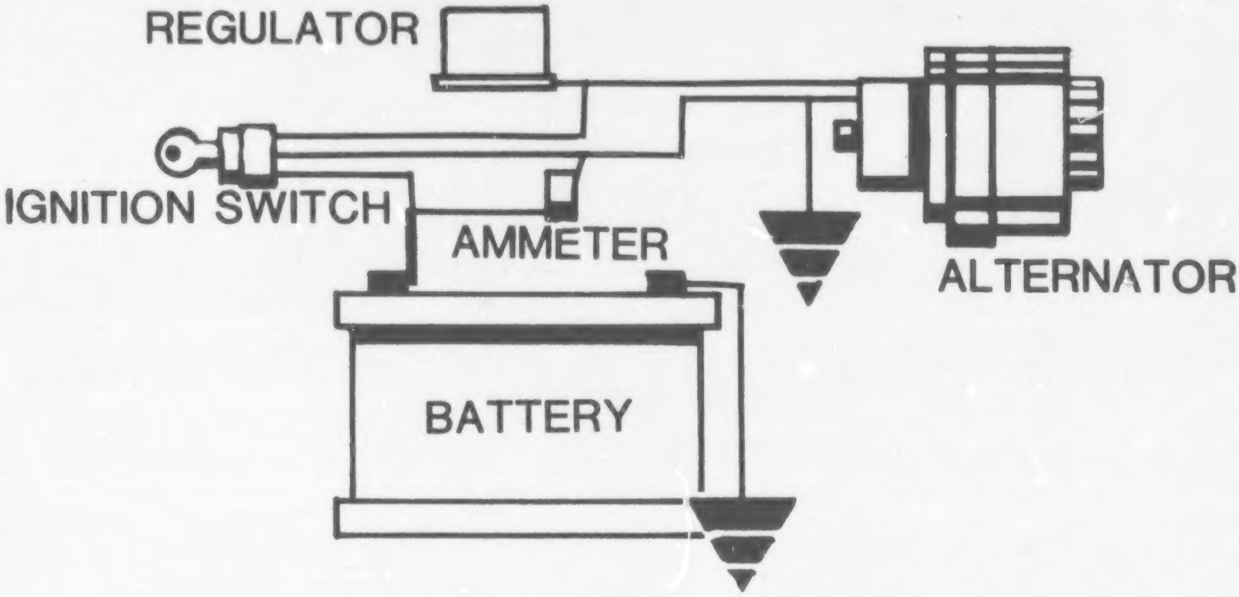

ACID AND WATER
(ELECTROLYTE)
TERMINAL POST
TOP COVER
CELL. CONNECTOR
PLATE STRAP
POSITIVE PLATE
SEPARATOR
NEGATIVE PLATE
BATTERY CASE
ELEMENT
CELL CONNECTOR
SEDIMENT SPACE

COMPARISON OF CRANKING POWER

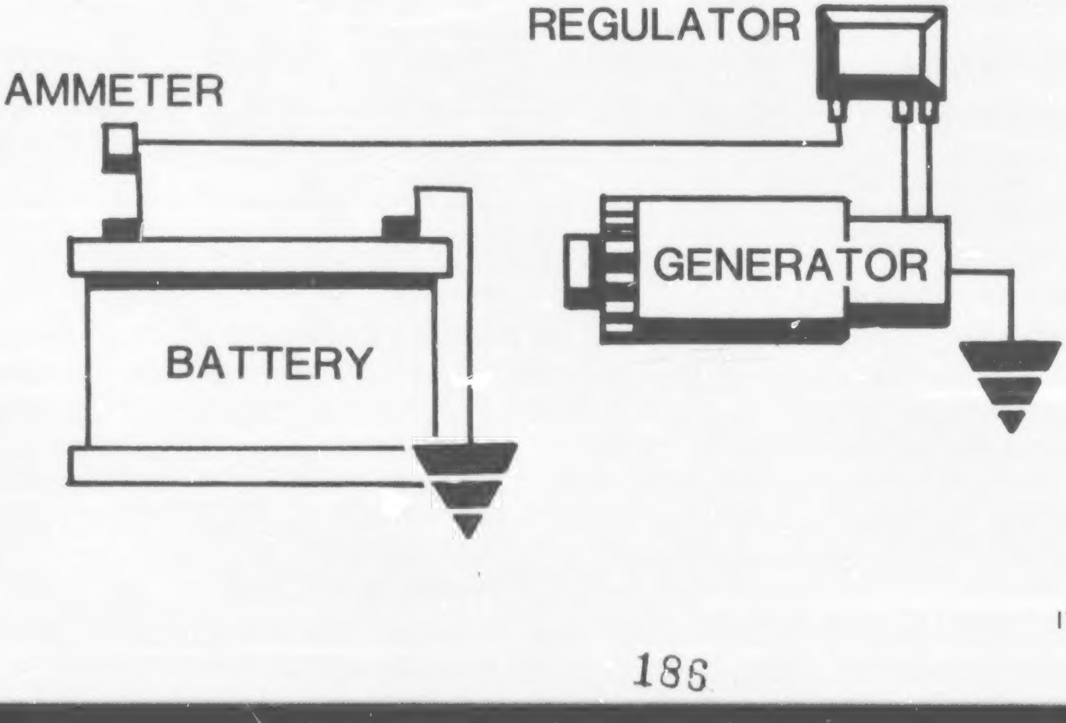


CHARGING SYSTEMS

A–C CHARGING SYSTEM

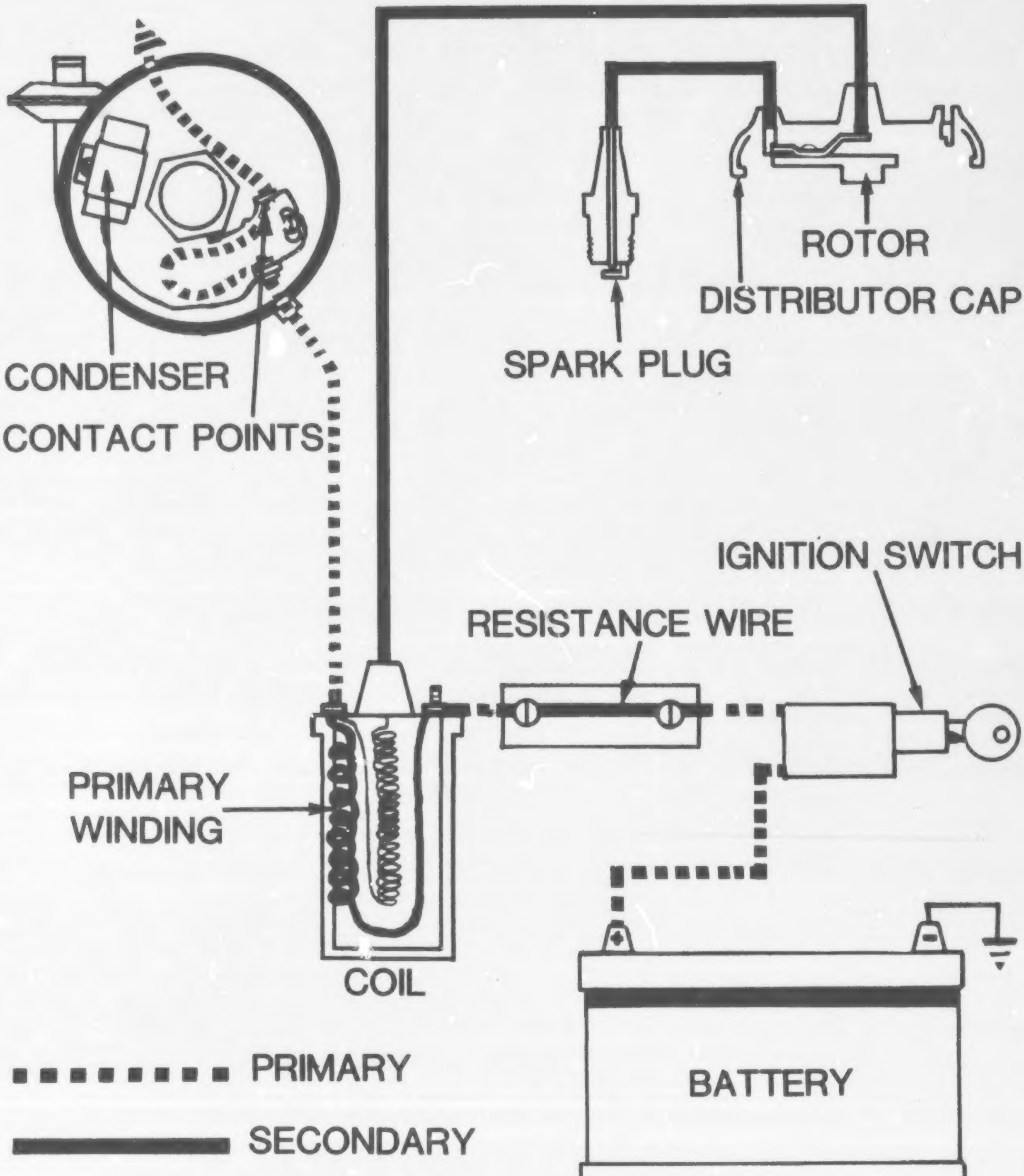

REGULATOR
IGNITION SWITCH
AMMETER
ALTERNATOR
BATTERY

D–C CHARGING SYSTEM


REGULATOR
AMMETER
GENERATOR
BATTERY

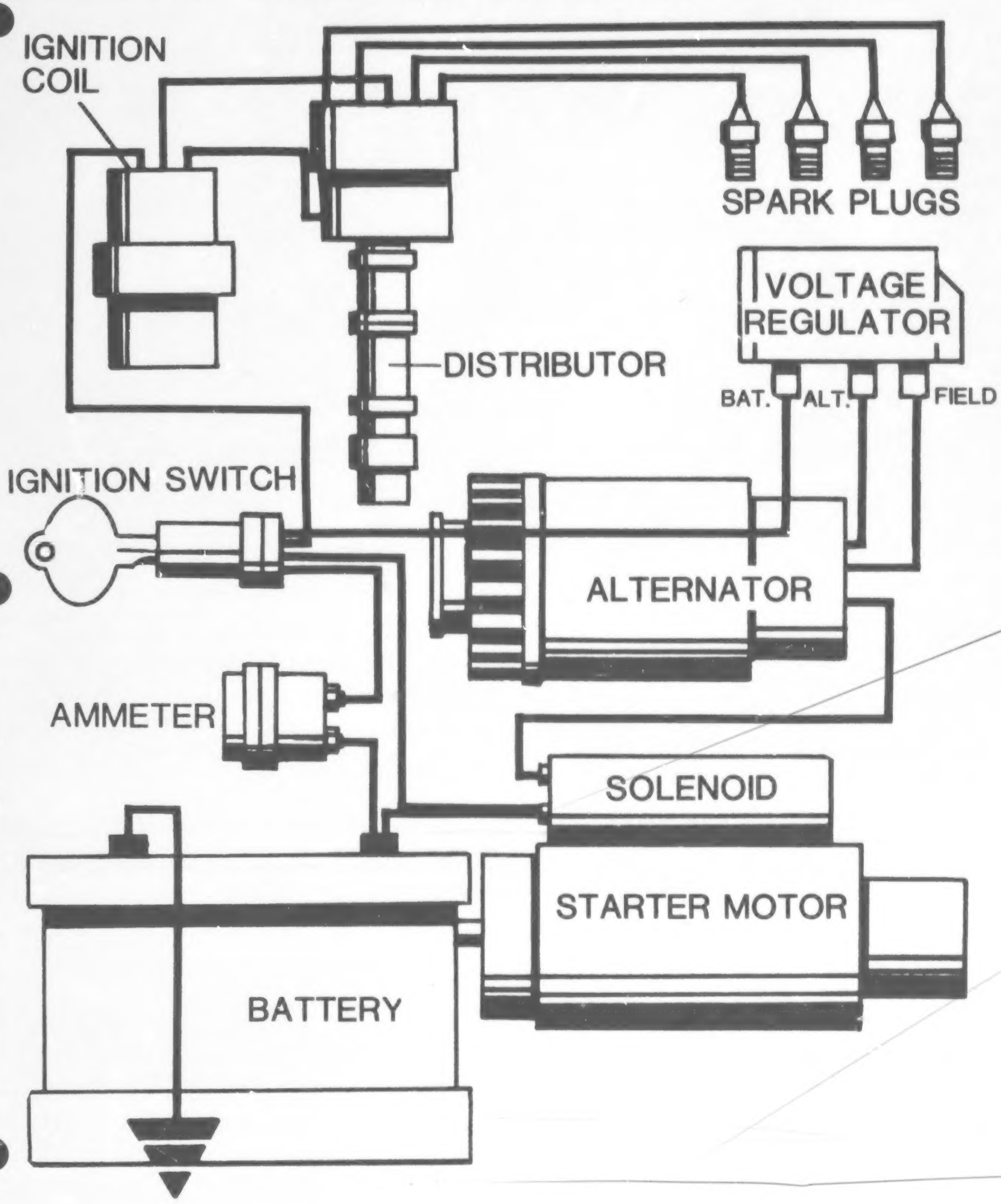
IV-H-3-67

PRIMARY AND SECONDARY IGNITION CIRCUITS

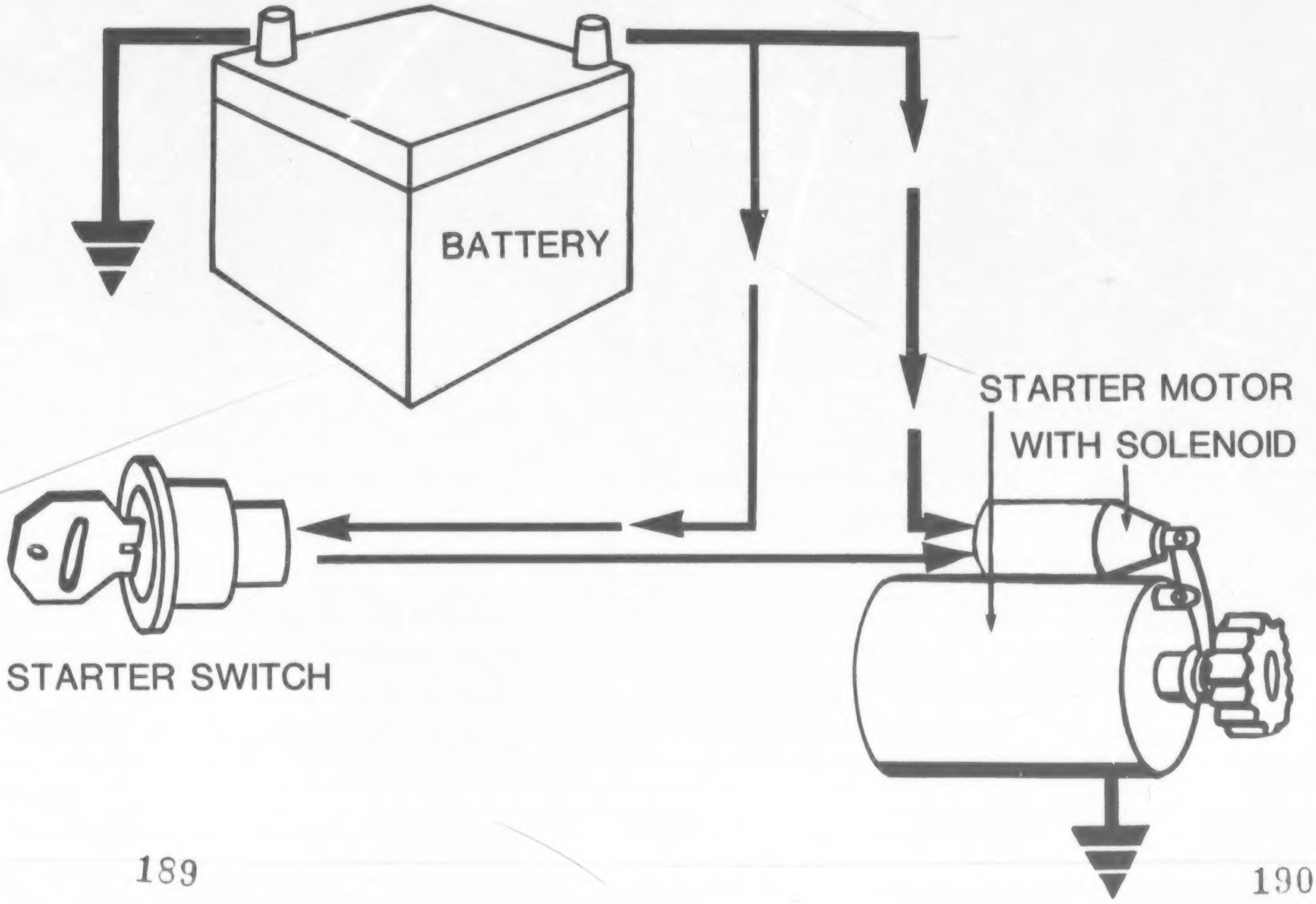

ROTOR
DISTRIBUTOR CAP
SPARK PLUG
CONDENSER
CONTACT POINTS
IGNITION SWITCH
RESISTANCE WIRE
PRIMARY WINDING
COIL
BATTERY
PRIMARY
SECONDARY

IV-H-3-68

ELECTRICAL SYSTEM ON SPARK IGNITION ENGINE

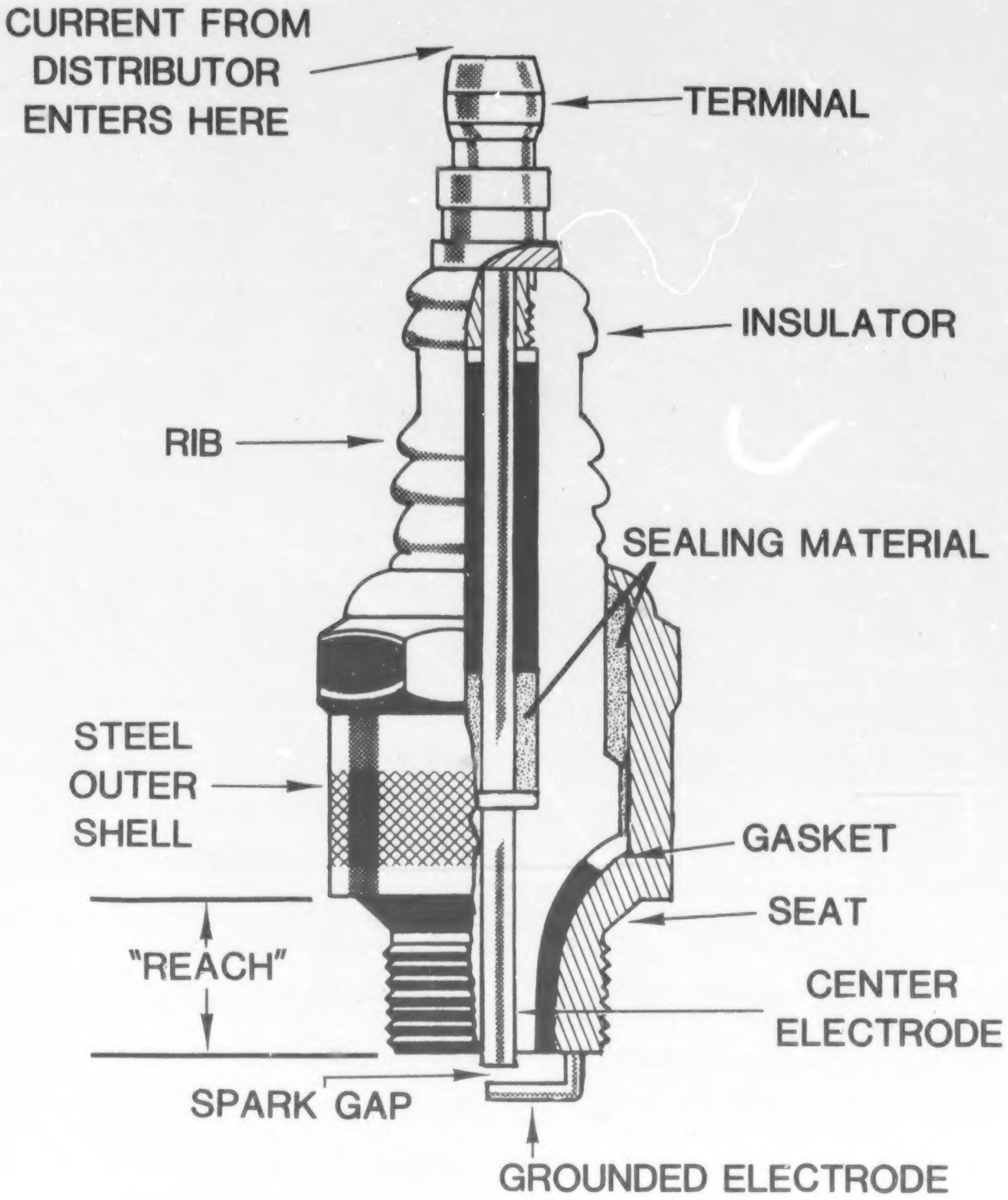

IGNITION COIL
SPARK PLUGS
VOLTAGE REGULATOR
DISTRIBUTOR
BAT.
ALT.
FIELD
IGNITION SWITCH
ALTERNATOR
AMMETER
SOLENOID
STARTER MOTOR
BATTERY

STARTING SYSTEM

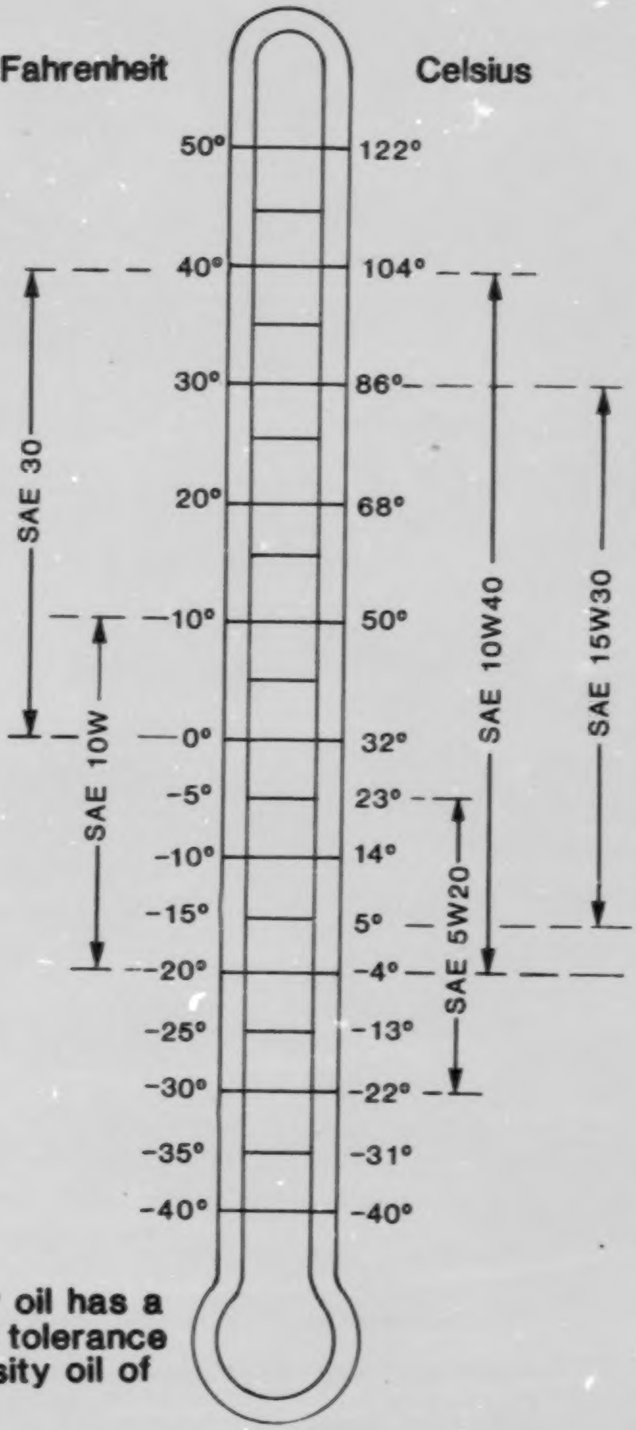

BATTERY
STARTER MOTOR
WITH SOLENOID
STARTER SWITCH

IV-H-3-70

THE PARTS OF A SPARK PLUG

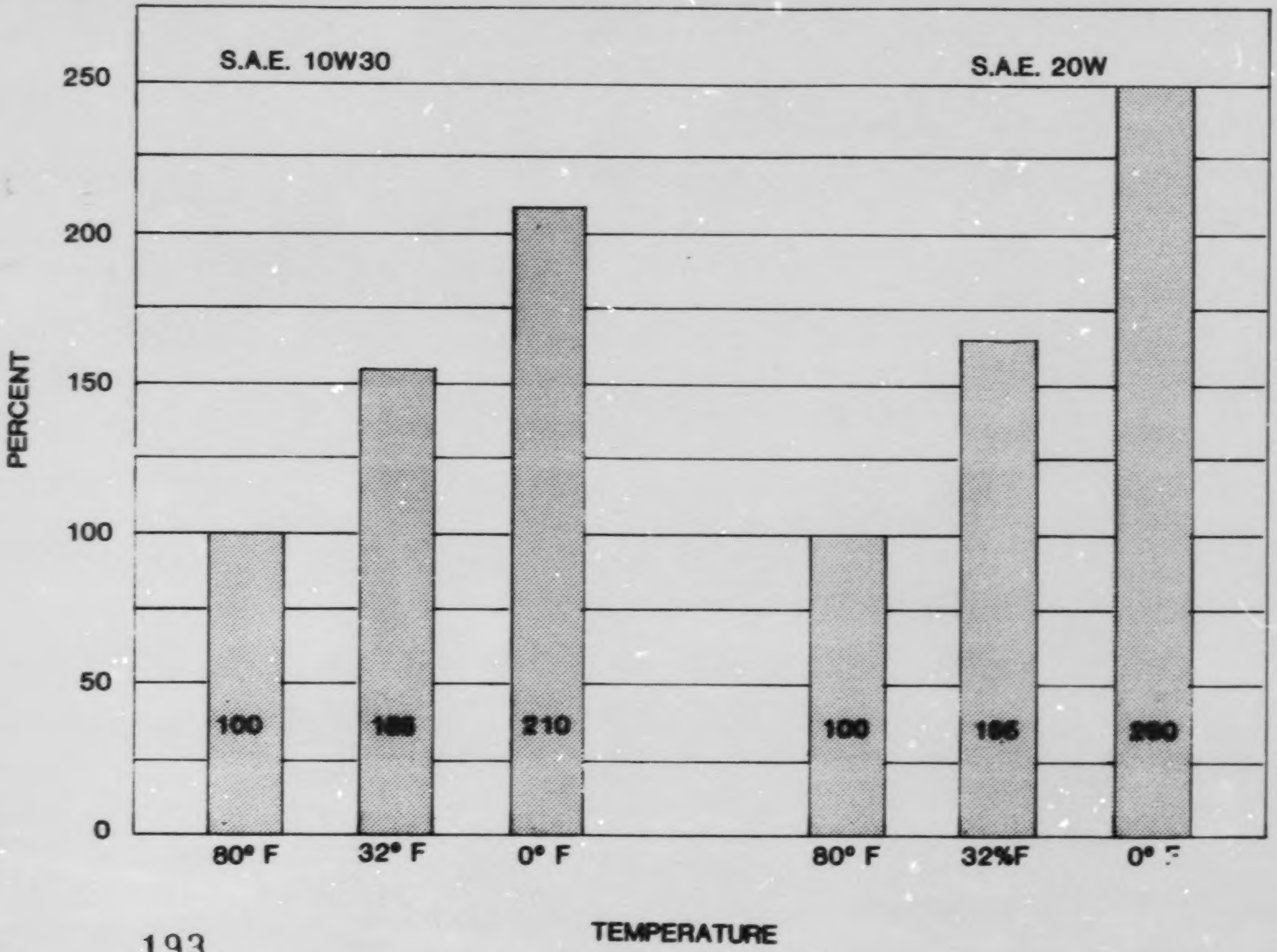

CURRENT FROM DISTRIBUTOR ENTERS HERE
TERMINAL
INSULATOR
RIB
SEALING MATERIAL
STEEL OUTER SHELL
GASKET
SEAT
"REACH"
CENTER ELECTRODE
SPARK GAP
GROUNDED ELECTRODE

OIL VISCOSITY AND AIR TEMPERATURE



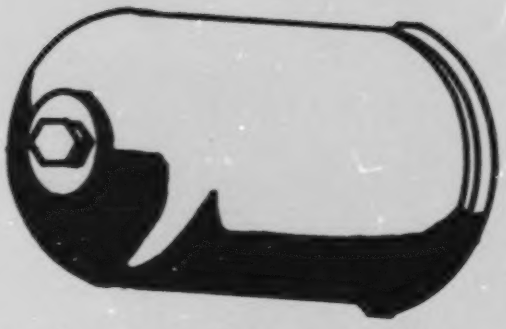
A single -viscosity oil has a higher temperature tolerance than a multi-viscosity oil of the same number.

COMPARISON OF POWER REQUIRED TO CRANK

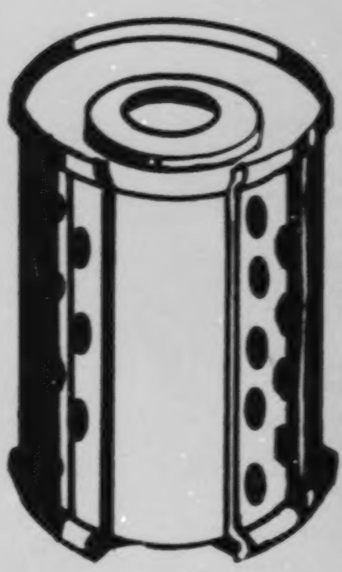


IV-H-3-73

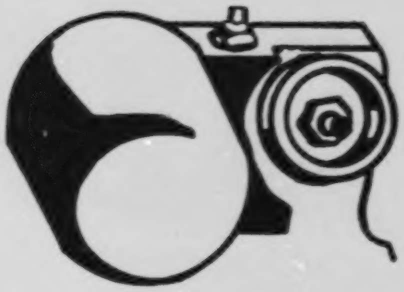
TYPES OF OIL FILTERS



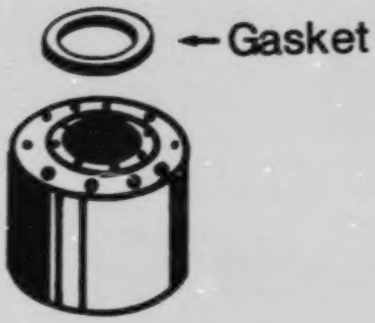
FILTER BOWL



FILTER ELEMENT

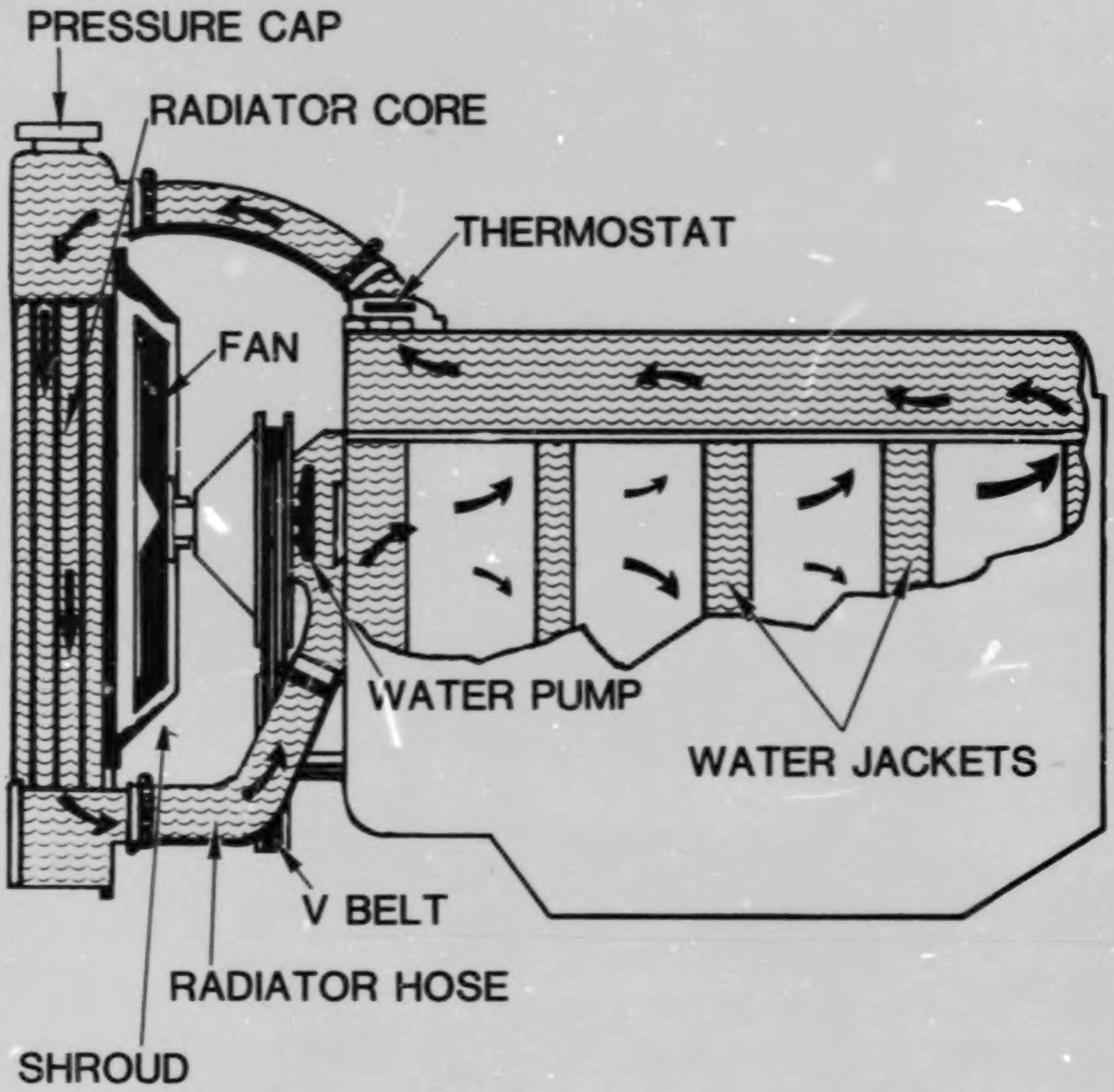


"SPIN-ON" FILTER



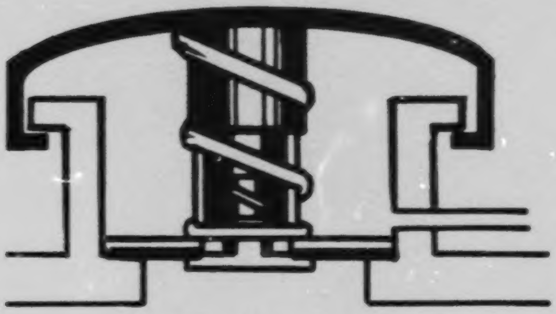
Filter

PARTS OF A COOLING SYSTEM


PRESSURE CAP
RADIATOR CORE
THERMOSTAT
FAN
WATER PUMP
WATER JACKETS
V BELT
RADIATOR HOSE
SHROUD

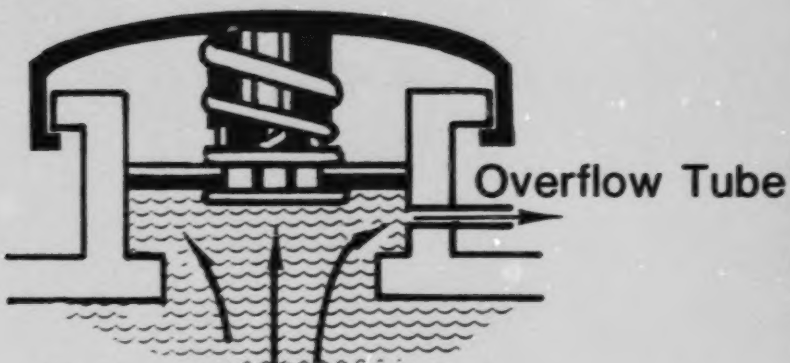
PRESSURE CONTROL RADIATOR CAP

Normal Operation



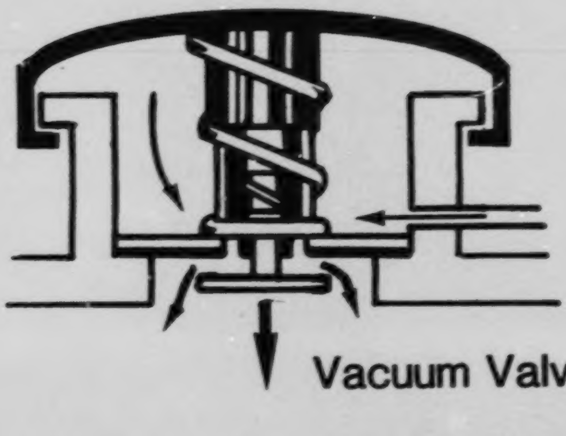
Valves Closed

Excessive Pressure



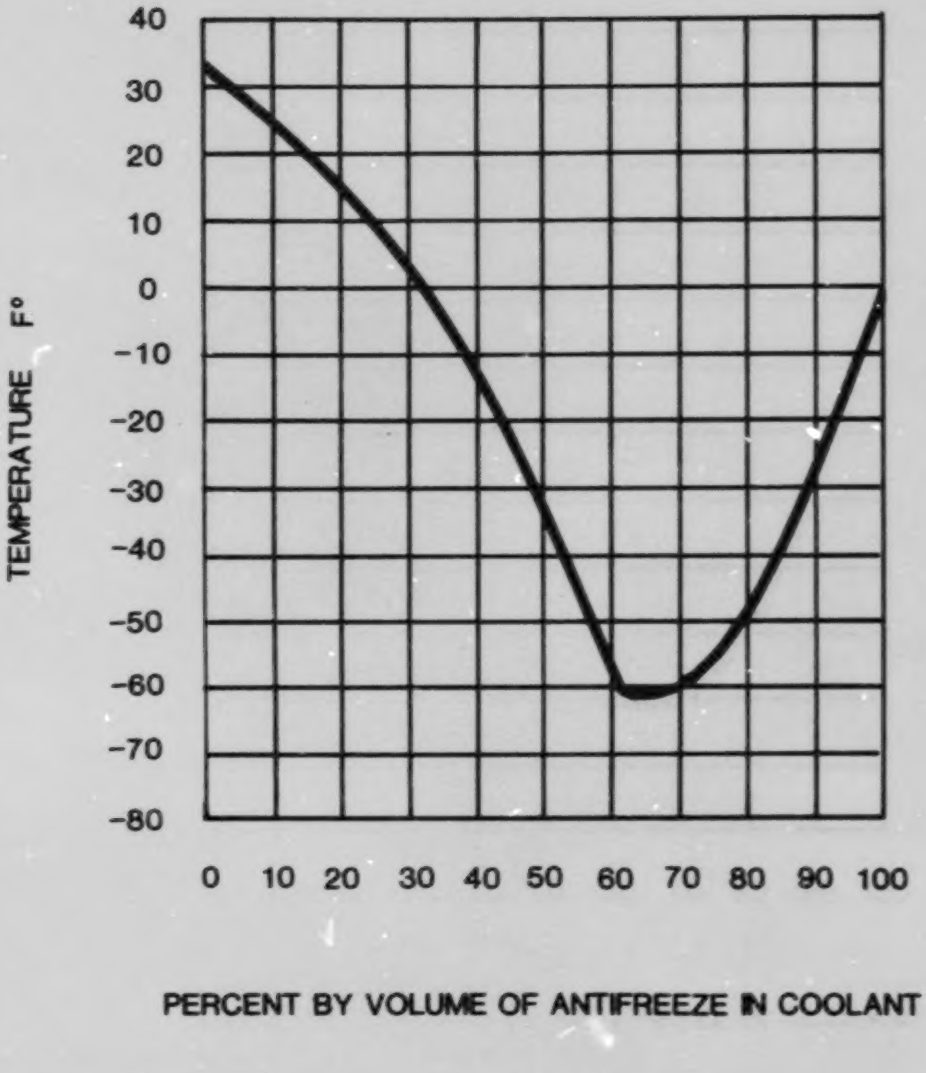
Pressure Valve Open

Cooling-off Period

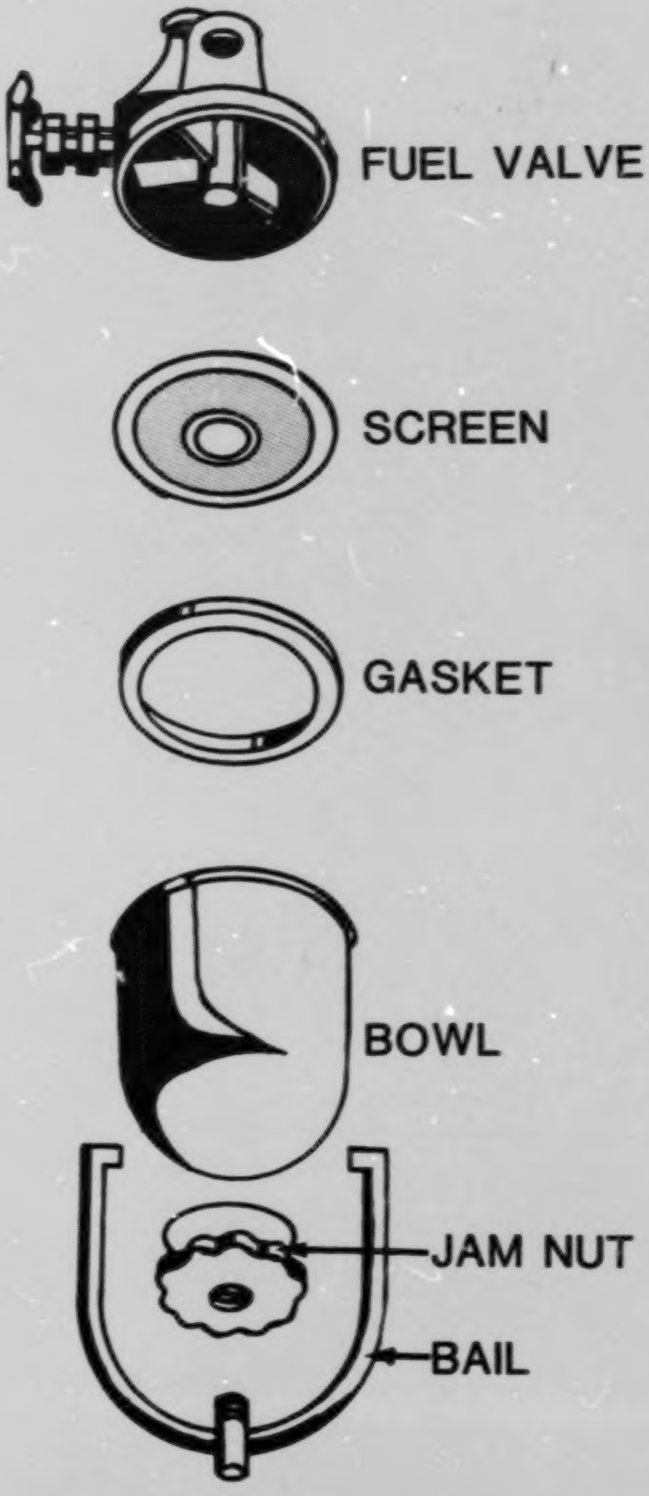


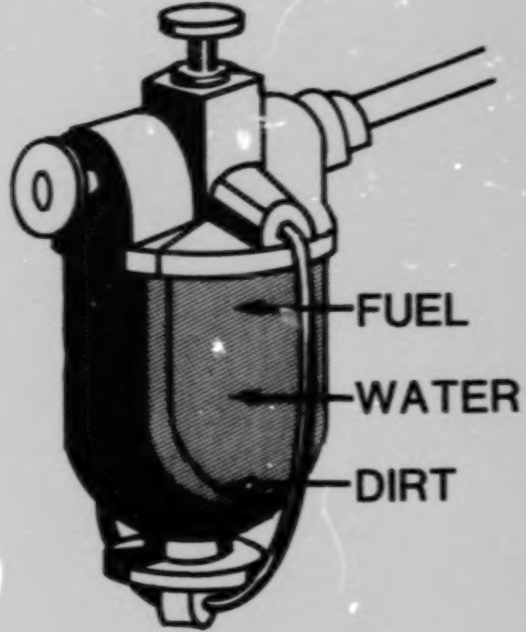
Vacuum Valve Open

FREEZING POINTS OF WATER/ANTIFREEZE SOLUTION

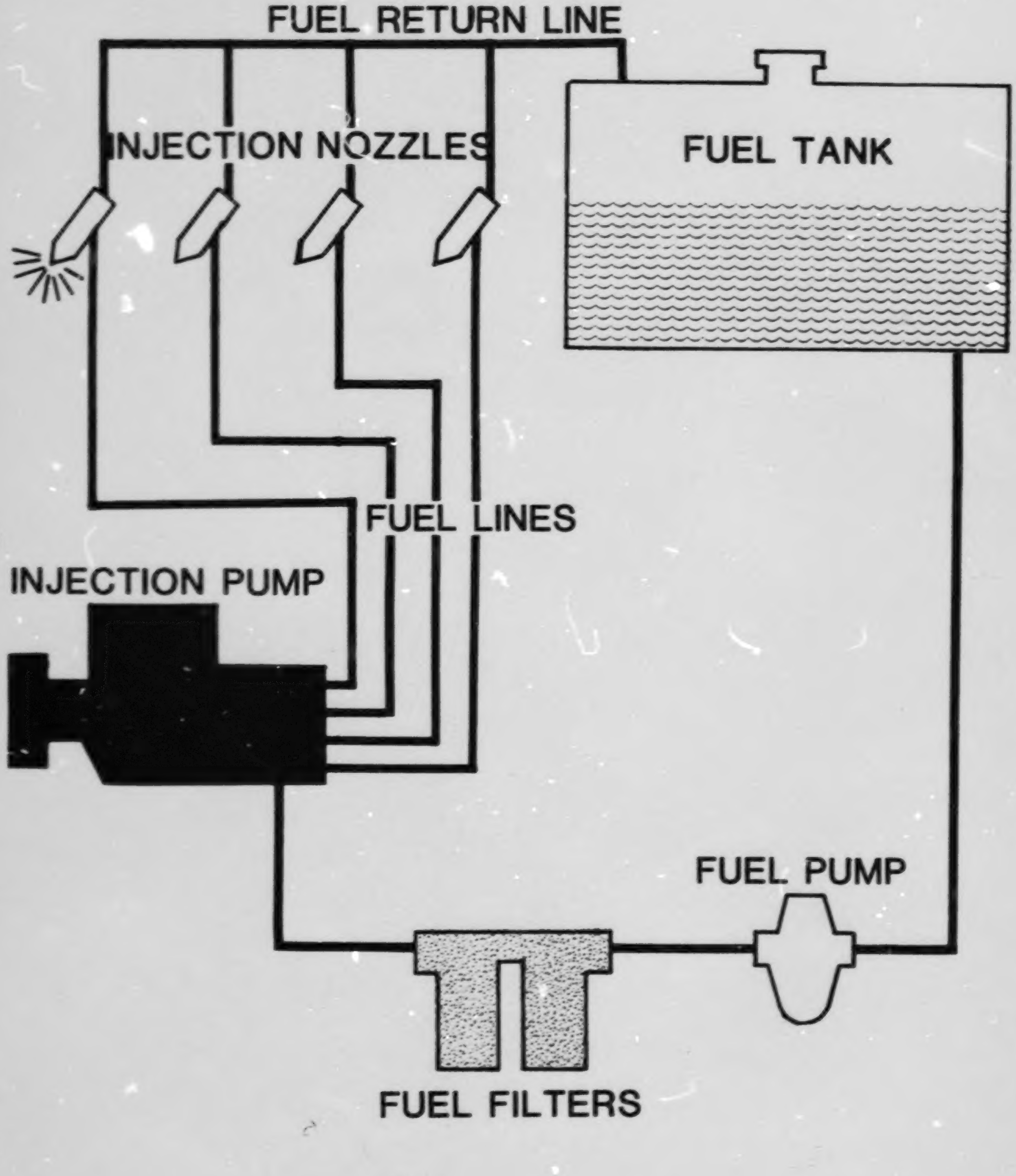


PARTS OF A SEDIMENT BOWL

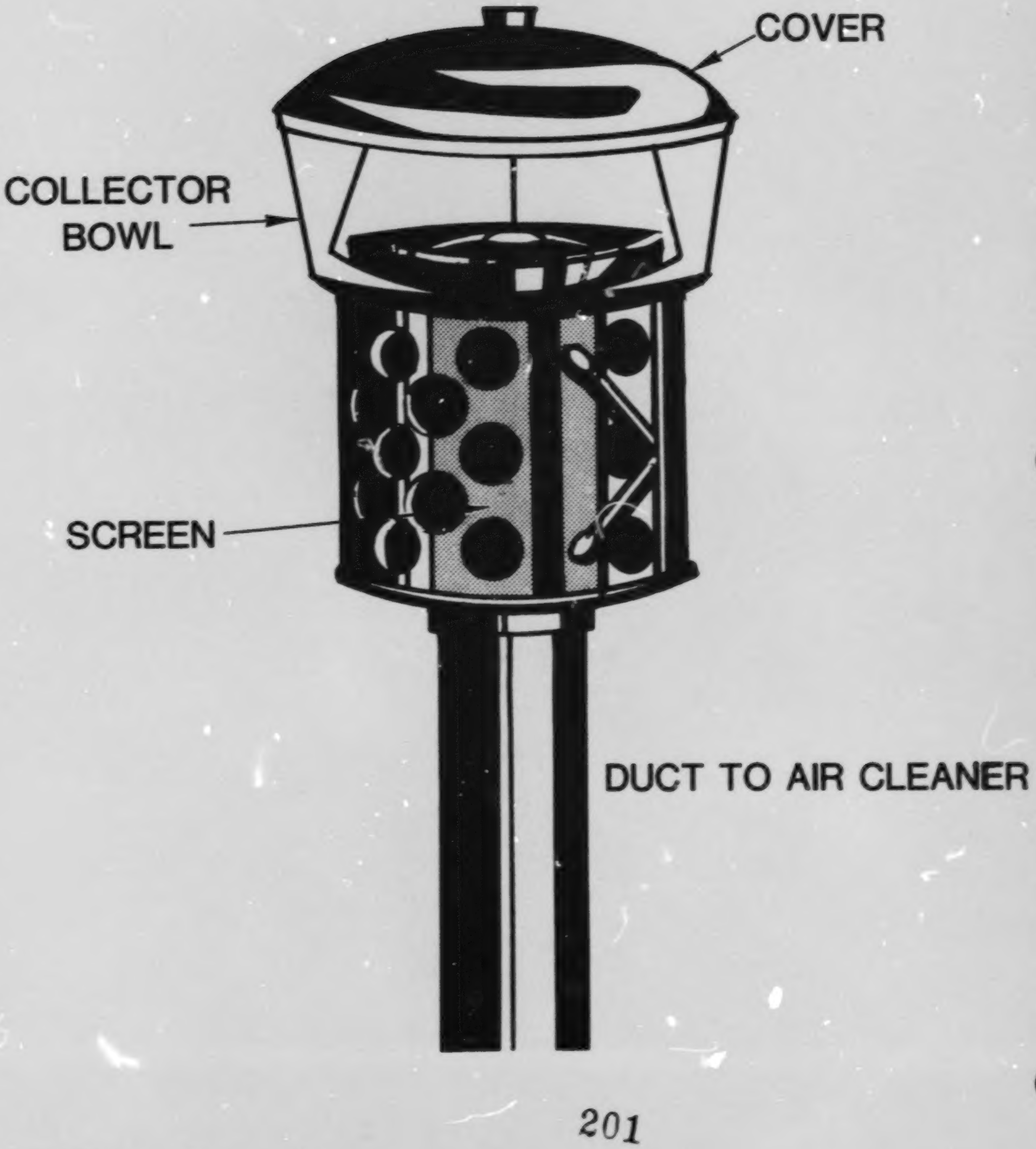

FUEL VALVE
SCREEN
GASKET
BOWL
JAM NUT
BAIL


FUEL
WATER
DIRT

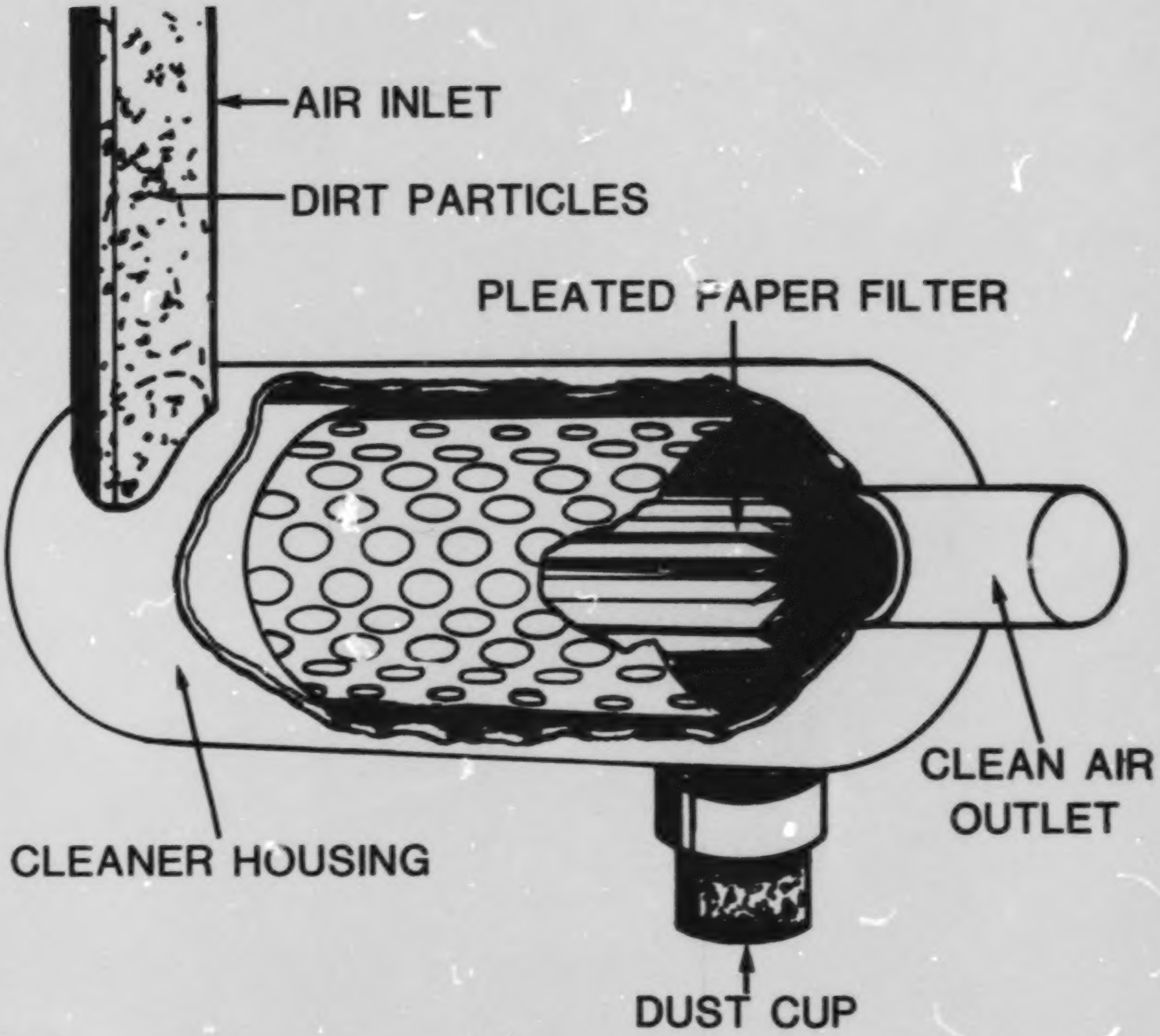
DIESEL ENGINE FUEL SYSTEM


FUEL RETURN LINE
INJECTION NOZZLES
FUEL TANK
FUEL LINES
INJECTION PUMP
FUEL PUMP
FUEL FILTERS

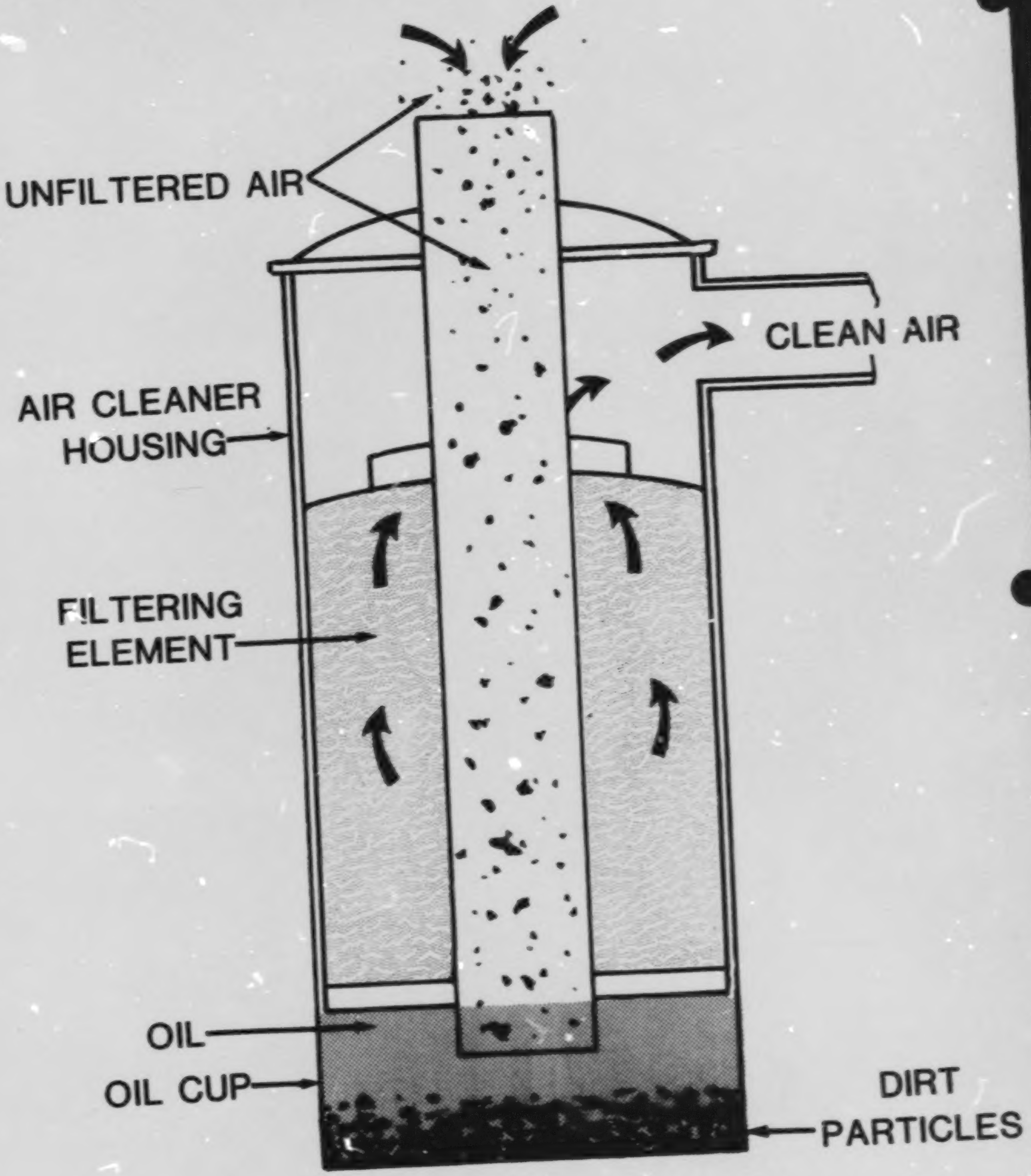
PRE-CLEANER AIR FILTER


COVER
COLLECTOR BOWL
SCREEN
DUCT TO AIR CLEANER

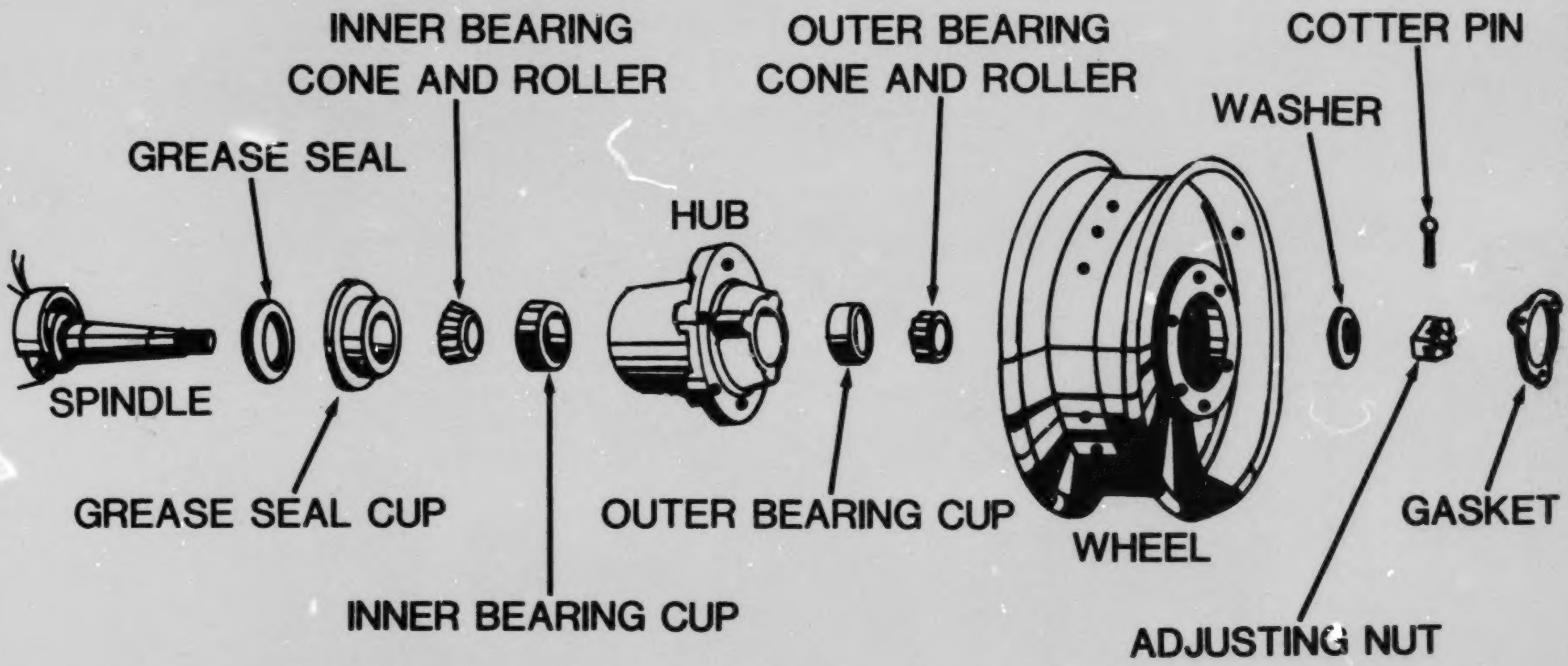
DRY-TYPE AIR FILTER


AIR INLET
DIRT PARTICLES
PLEATED PAPER FILTER
CLEAN AIR OUTLET
CLEANER HOUSING
DUST CUP

OIL-BATH AIR FILTER

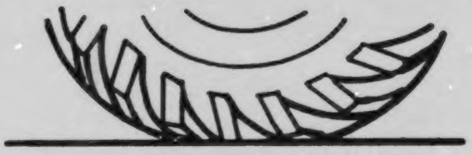

UNFILTERED AIR
CLEAN AIR
AIR CLEANER HOUSING
FILTERING ELEMENT
OIL
OIL CUP
DIRT PARTICLES

PARTS OF A WHEEL BEARING ASSEMBLY

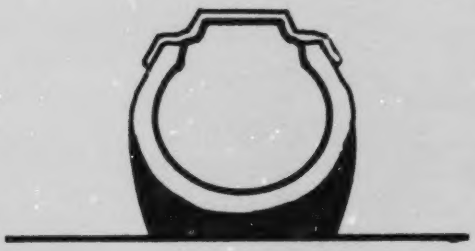

INNER BEARING CONE AND ROLLER
OUTER BEARING CONE AND ROLLER
COTTER PIN
WASHER
GREASE SEAL
HUB
SPINDLE
GREASE SEAL CUP
OUTER BEARING CUP
WHEEL
GASKET
INNER BEARING CUP
ADJUSTING NUT

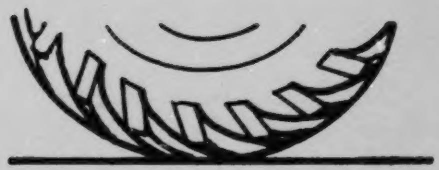
IV-H-3-83

PROPER TIRE INFLATION

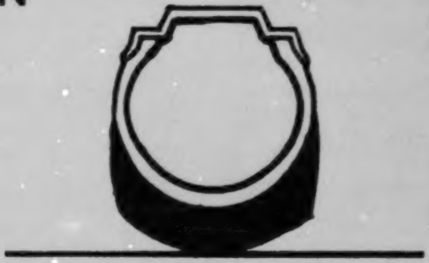


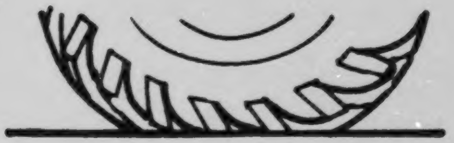
PROPER INFLATION



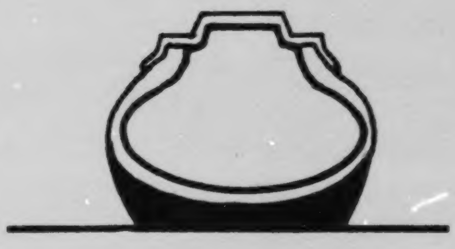


OVER INFLATION





UNDER INFLATION



TRANSPARENCY DISCUSSION GUIDE

MAINTAINING AND SERVICING TRACTORS

Transparencies--UNIVERSAL CONTROL SYMBOLS

A. Discuss the importance of monitoring the various systems of tractors.

B. Have students identify the various symbols by the name of each as an interest approach or quiz.

C. Have students locate these gauges on a demonstration tractor or their own.

Transparencies--HOUR METERS DETERMINE SERVICE INTERVALS, TRACTOR MAINTENANCE SERVICE, and SERVICE SCHEDULE FOR TRACTOR

A. Ask students to identify as many service operations as they can which need to be done on tractors.

B. Discuss how to determine when these service operations need to be done.

C. Identify and discuss the importance of good recordkeeping of tractor maintenance schedules.

Transparencies--PARTS OF A BATTERY, PRIMARY AND SECONDARY IGNITION CIRCUITS, ELECTRICAL SYSTEM ON SPARK IGNITION ENGINE, STARTING SYSTEM, PARTS OF A SPARK PLUG, and COMPARISON OF CRANKING POWER

A. Use these transparencies to help supplement your discussion on the importance of servicing the ignition system.

B. Explain the importance of proper handling and care of a storage battery. Use the transparency to show how batteries are constructed.

C. Emphasize the importance of keeping batteries fully charged. Show how battery capacity is reduced by cold.

D. Point out and discuss the maintenance on various parts of the ignition system.

E. Review the procedures used in selecting and servicing spark plugs, points, condensor, etc.

Transparencies--OIL VISCOSITY AND AIR TEMPERATURE, COMPARISON OF POWER REQUIRED TO CRANK, and TYPES OF OIL FILTERS

A. Discuss the importance of selecting the proper type of oil for the operating conditions of the tractor.

B. Point out the differences in temperature tolerances of single and multi-viscosity oils.

C. Point out the cranking power requirements and how they are affected by weight of oil and temperature

D. Discuss care and changing of various types of oil filters.

Transparencies--PARTS OF COOLING SYSTEM, RADIATOR CAP, FREEZING POINTS OF ANTIFREEZE SOLUTIONS

A. Review the servicing and maintenance of cooling systems.

B. Discuss the importance of using the proper type of radiator cap and why it has a certain pressure requirement.

C. Discuss the importance of antifreeze mixtures. Point out that pure antifreeze does not provide as much protection in cold weather as a water/antifreeze solution.

Transparencies--PARTS OF A SEDIMENT BOWL, DIESEL ENGINE FUEL SYSTEM

A. Review service and maintenance of fuel systems.

B. Discuss importance of keeping fuel clean and free of contamination.

Transparencies--PRE-CLEANER AIR FILTER, DRY-TYPE AIR FILTER, AND OIL-BATH AIR FILTER

A. Outline the proper procedure to use in servicing air cleaners.

B. Discuss the importance of regular maintenance of the air cleaners.

Transparencies--PARTS OF A WHEEL BEARING, PROPER TIRE INFLATION

A. Discuss the necessity of timely tire and wheel servicing and inspection.

B. Review the procedures for wheel bearing and tire service.

TEACHER'S KEY

SAMPLE TEST QUESTIONS

MAINTAINING AND SERVICING TRACTORS

PART I (Short Answer)

1. What is the most efficient way to prolong tractor life?
   Regularly perform preventive maintenance.

2. Who established universal recommendations for servicing tractors?
   The American Society of Agricultural Engineers.

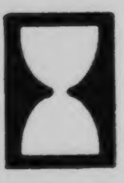
3. What is the first thing you should do before operating your tractor?
   Read the operator's manual.

4. When should you fill a fuel tank?
   At the end of the day to prevent the water formed by condensation.

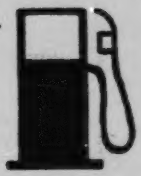
5. Label these servicing symbols.

A. hours B. fuel C. grease D. oil E. air filter

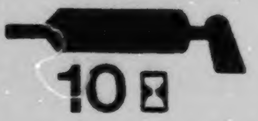
A.



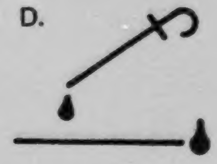
B.



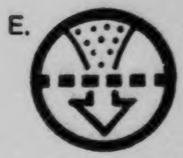
C.



D.



E.



6. What electrical system is not present on a diesel engine? Why?
Ignition system
Because heat from compression ignites the fuel.

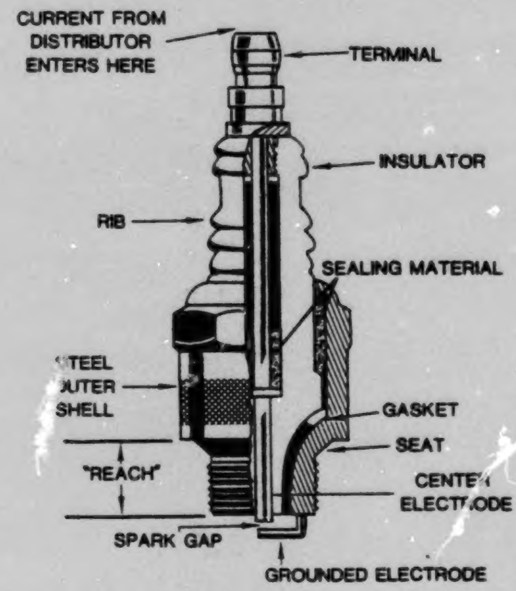
7. Approximately how many volts does a battery cell produce?
Two.

8. How long can you crank a starter motor continuously before causing damage?
30 seconds

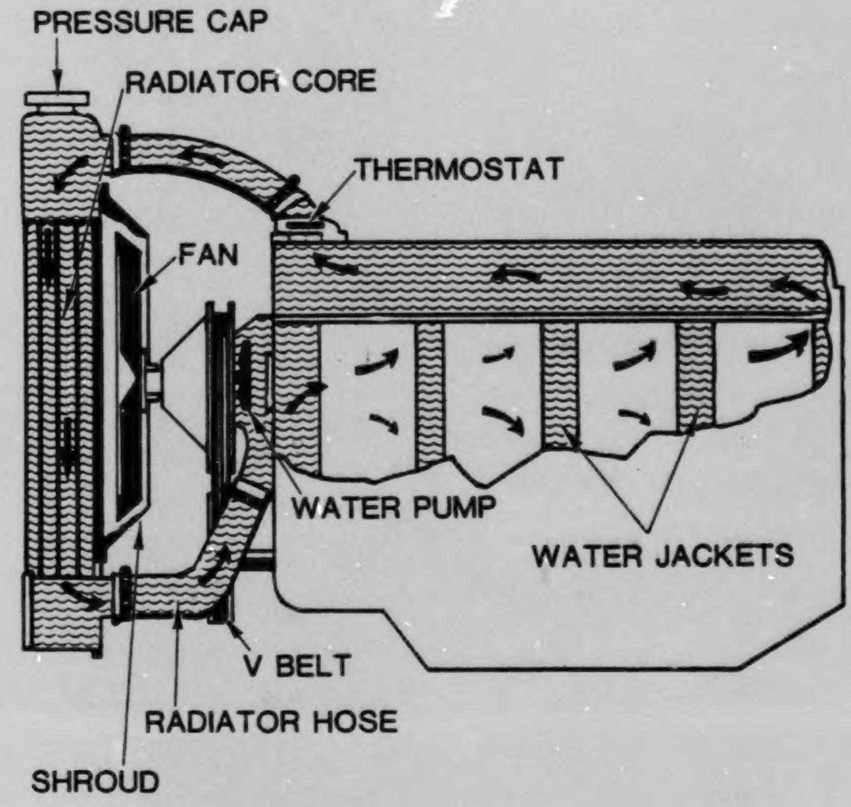
9. What is the difference between primary and secondary circuits?
The primary circuit is the low voltage circuit from the power source. The secondary circuit is the high voltage circuit produced by the coil and goes to the spark plugs.

10. How does cold weather affect a battery?
It lowers the power output of the battery

11. Label the parts of the spark plug.


CURRENT FROM DISTRIBUTOR ENTERS HERE
TERMINAL
INSULATOR
RIB
SEALING MATERIAL
STEEL OUTER SHELL
GASKET
SEAT
"REACH"
CENTER ELECTRODE
SPARK GAP
GROUNDED ELECTRODE

12. Label parts of the cooling system.


PRESSURE CAP
RADIATOR CORE
THERMOSTAT
FAN
WATER PUMP
WATER JACKETS
V BELT
RADIATOR HOSE
SHROUD

13. Diagram an ignition system and label it including primary and secondary circuits.

14. How do you service a coil?
    You replace it with a new one.

15. Name 2 types of air filters.
    Oil bath air filter
    Dry element air filter.

16. What does a pre-cleaner do?
Removes large particles of dirt and extends the service interval of the air filter.

17. List 3 functions of a muffler.

a) carry away gases

b) reduce engine noise

c) remove heat from exhaust

18. What do cetane numbers measure?
The speed of spontaneous combustion.

19. What parts are present in a gasoline system but absent in diesel systems?
The carburetor and sediment bowl.

20. What is the basic difference between gasoline and diesel engines?
Gasoline is ignited by spark plugs and diesel engines are ignited by compression.

21. What would you use a CD designated oil in?
Severe duty diesel engine service.

22. What does API stand for?
American Petroleum Institute.

23. What do the terms CD and API have to do with oil?
The API has developed performance standards for oils which the call service classifications. CD is one of these classifications.

24. What is the major cause of hydraulic problems?
Dirt

PART II (Matching)

Put the appropriate system or systems by each part.

1. Ignition
2. Intake
3. Exhaust
4. Starting
5. Charging
6. Diesel
7. Gasoline
8. Cooling
9. Lubrication
10. Hydraulic
11. Power train
12. Wheels and tires

1,4,5 A) Battery
3 B) Muffler
8 C) Radiator
5 D) Alternator
1 E) Spark plug
1 F) Coil
8 G) Fan
12 H) Hub cap
7 I) Sediment bowl
2 J) Oil bath air filter
6 K) Injector
1 L) Distributor
6,7 M) Fuel tank
2,3 N) Turbo charger
2 O) Dry type air filter
1 P) Condenser
8 Q) Pressure cap
9 R) Oil
7 S) Carburetor
8 T) Thermostat
1 U) Breaker points
10 V) 3-point hitch
10 W) Power steering
8 X) Water pump
11 Y) Gear shift
1,4 Z) Key switch

PART III (True or False)

F 1. A turbo charger is belt driven.

T 2. Overinflation of tires causes a rough ride.

F 3. Stress cracks on tire sidewalls usually means overinflation.

F 4. You should grease all fittings until you see grease come out of bearing.

F 5. Oil should be changed weekly.

F 6. High oil pressure causes overheating.

T 7. Oil helps cool moving parts.

F 8. Air cooled engines require no cooling system maintenance.

T 9. Antifreeze may raise the boiling point of water.

F 10. Hydrometer readings are correct at any temperature.

F 11. Antifreeze and water are mixed 34% to 66%.

T 12. Thermostats prevent overheating.

T 13. Octane rating is the ability to resist detonation.

T 14. Cetane rating is the speed of spontaneous combustion.

F 15. #1 diesel fuel is low volatility.

T 16. Gasoline engines use up to 9000 gallons of air per gallon fuel.

F 17. Naturally aspirated engines have turbo chargers.

F 18. Dry filters need more service than oil baths.

F 19. Any oil can be used in oil bath filters.

F 20. Diesel engines have spark plugs.

F 21. Battery electrolyte is non-corrosive.

T 22. Specific gravity tells the charge on a battery.

T 23. Preventive maintenance saves money.

T 24. Baking soda dissolves acid.

F 25. Starter motors blow up after running 30 seconds.

UNIT I: Agricultural Business Management

PROBLEM AREAS:

1. Understanding and Using Basic Economic Principles of Production
2. Managing Credit in Agriculture
3. Planning an Insurance Program
4. Using Illinois Farm Record Book
5. Understanding Agricultural Taxes
6. Using Microcomputers in Agricultural Business Management
7. Understanding Basic Agricultural Law
8. Planning an Agricultural Production Business

UNIT I: AGRICULTURAL BUSINESS MANAGEMENT

PROBLEM AREA: UNDERSTANDING AND USING BASIC ECONOMIC PRINCIPLES OF PRODUCTION

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during late winter or early spring months before seasonal spring work begins in agricultural businesses.

The estimated instructional time for this problem area is 5 to 10 days depending on how far the teacher wishes to go in developing an awareness of basic economic principles of production. If the students are to be involved in other exercises, the instructional time will need to be increased.

Instructors are encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modificaton as instructors adapt these materials to their local situation.

CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-24-D-0362-466 with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, student worksheets, transparency discussion guide, and sample test questions were developed by Jerry Pepple, Department of Vocational and Technical Education, University of Illinois. The artwork in this problem area was prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture teachers:

Everett Moeller - Beecher High School
John Abell - Teutopolis High School
Glenn Sims - Windsor High School
C. Eugene McGrew - Bushnell-Prairie City High School
Donald Miller - New Holland High School

TEACHER'S GUIDE

I. Unit: Agricultural business management

II. Problem area: Understanding and using basic economic principles of production

III. Objectives: At the close of this problem area students will be able to:

1. Name and classify basic agricultural business resources.
2. Apply the principle of diminishing returns to an agricultural business.
3. Apply the principle of equimarginal returns to an agricultural business.
4. Apply the principle of opportunity cost to an agricultural business.
5. Understand the concept of fixed and variable costs as they apply to an agricultural business.
6. Explain the principles of resource substitution and product substitution.
7. Debate the principle of diversifying or specializing production.

IV. Suggested interest approaches:

1. Begin class discussion by raising the following questions with the class:
   a. What is farm management?
   b. What is business management?
   c. Are you a good manager?
   d. What makes a good manager?
   e. What is the economic goal of an agribusiness?
2. Ask the class if the local FFA Chapter is well managed. How do you know?
3. Ask the class to list the characteristics of a good manager and a poor manager. Review the transparencies on managers included in this problem area and add to the list.
4. Ask the class to respond to the question, "What is an economic principle of production?" Introduce practical examples of one or two of the principles without naming them.
5. Distribute examples of newspaper or magazine articles which are discussing economic principles of production and ask the students to explain the purpose of the articles and how they could benefit a production manager.

6. Set up a "problem farm" example and give students the responsibility of identifying and making essential management decisions. Promote student interest by raising selected management problems and concerns.

7. Refer students to the budget records in their "Supervised Experience Program Record Book" and have them select local examples of resources, products, management decision points, etc.

V. Anticipated problems and concerns of students:

1. What is farm or production management?

2. What types of decisions do production managers make?

3. What are the common characteristics of good production managers? Of poor managers?

4. What are the major steps of decision making or management?

5. Who has the responsibility for making production management decisions?

6. How does good management improve a business operation?

7. What is a production resource?

8. What is a production product?

9. What are the resources used in a farm business? agribusiness?

10. How are resources classified?

11. How should production resources be combined for maximum benefit?

12. What is an economic principle?

13. What are some "tools" which can be used in production management?

14. What is the principle of diminishing returns and how is it used?

15. What is the relationship between total, average, and marginal product when considering the stages of diminishing physical output?

16. How do I determine where to operate when using a diminishing returns graph?

17. What is the economic principle of equimarginal returns and how do I use it when making management decisions?

18. What is the principle of opportunity cost and how is it used in management?

19. What are fixed and variable production costs?

20. How does the economic law of comparative advantage work?

21. What is meant by resource substitution?

22. What is meant by product substitution?

23. What career opportunities exist for people interested in production management?

24. What career opportunities exist for people interested in agribusiness management?

VI. Suggested learning activities and experiences:

1. Identify and conduct an interest approach to increase students' interest and questions about production and business management.

2. Have students develop a list of their problems and concerns about production and business management. If students do not have concerns of their own, have them role play the part of a manager of an agribusiness which needs to make a profit.

3. Add additional problems and concerns to the student list to cover the management principles to be taught.

4. Reorder and group the list of problems and concerns into teachable topic areas.

5. Distribute VAS Unit 2040a, "Agricultural Business Management - Principles That Affect Production," and conduct supervised study so students can answer problems and concerns.

6. Conduct a discussion of problems and concerns. Provide additional information to students which they could not find in the reference.

7. Review and distribute selected student worksheets included in this problem area to give students practice in using the selected principles of production management.

8. Have students work out various management charts and graphs using information from their supervised experience program record book.

9. Review and/or define the following terms related to agricultural business management:

   a. production management
   b. resource
   c. product
   d. diminishing returns
   e. equimarginal returns
   f. opportunity cost

10. Invite a professional production manager to class to discuss the "management tools" they use to help make a good management decision.

11. Identify possible agri-management careers and determine the qualifications needed for successful entry into these careers.

VII. Application procedures:

1. Have students apply these economic principles to their S.O.E. programs.

2. Have students relate these economic principles to their personal financial situation.

VIII. Evaluation:

1. Grade written exercises and worksheets.

2. Evaluate students' contribution to classroom discussion.

3. Develop and administer a pencil and paper test.

IX. References and aids:

The following are available from Vocational Agriculture Service, College of Agriculture, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois 61801.

1. VAS Unit 2040a, Agricultural Business Management - Principles That Affect Production.

2. Farm Management Manual, AE-4473.

3. Standards of Measures of Efficiency, current year.

COMPETENCY INVENTORY

UNDERSTANDING AND USING BASIC ECONOMIC PRINCIPLES

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

	Competency	Circle One
1.	Determine the possible returns from different methods of resource and product utilization by using economic principles.	1 2 3 4 5
2.	Locate sources of economic information as it relates to production and agribusiness management.	1 2 3 4 5
3.	Apply basic principles of diminishing returns to agribusiness management.	1 2 3 4 5
4.	Apply basic principles of equimarginal returns to agribusiness management.	1 2 3 4 5
5.	Apply basic principles of opportunity cost to agribusiness management.	1 2 3 4 5
6.	Define common terms used in basic economic management information.	6 7

These competencies are outlined in the National Ag Occupations Competency Study, 1978, for entry level positions in agriculture.

Name ______________________ Date ______________

STUDENT WORKSHEET #1

PRINCIPLES OF PRODUCTION MANAGEMENT

(Refer to VAS Unit 2040a)

Select the most correct response to the following questions.

____ 1. In the production of a corn crop, the nitrogen fertilizer is properly defined in economics as
A. a resource.
B. a product.
C. a growth stimulator.
D. a fixed cost.

____ 2. The operator of a feed manufacturing business would consider
A. hog supplement, dairy supplement, and poultry supplement as resources.
B. soybean meal, minerals, and machinery as resources.
C. soybean meal, minerals, and machinery as products.
D. hog supplements, dairy supplements, and poultry supplements as variable costs.

____ 3. Wealth that occurs in nature and is used in production is defined as
A. capital.
B. a product.
C. land.
D. management.

____ 4. Capital is defined as
A. man-made wealth that is used primarily for the satisfaction it produces.
B. man-made wealth used in production.
C. natural wealth that is used in production.
D. physical energy used in the productive process.

____ 5. In order to have capital,
A. production must not exceed present requirements for living.
B. it is necessary to spend more than you take in.
C. it is necessary to be in business for yourself.
D. saving is necessary.

____ 6. In economics, labor is defined as
A. physical energy used in production.
B. mental energy used in planning an operation.
C. the cash needed to pay hired workers.
D. workers hired to make management decisions.

_____ 7. Management is
A. primarily concerned with conservation of resources.
B. primarily concerned with carrying on the routine operations of a business.
C. determining the amount of raw materials needed to produce a given amount of product.
D. increasing the amount of product being produced.

In a field test of nitrogen for corn the following results were observed - increasing N from 20 lb. to 70 lb. produced 32 more bu. per A - increasing from 70 to 120 lb. of N produced 7 more bu. per acre - increasing from 120 to 170 lbs. of N produced 3 more bu. of corn per acre - and increasing from 170 lbs. to 220 lbs. of N produced 2 more bu. of corn per acre.

_____ 9. The results from the above field test illustrates the economic law of
A. diminishing economic returns.
B. diminishing physical output.
C. substitution.
D. alternate uses.

_____ 10. In the above test, if N costs $4.00 per unit and corn is worth $3.00 per bushel, adding first additional 50 lb. of N will result in
A. a return of $96 for $4.00 invested in N.
B. a return of $32 for $4.00 invested in N.
C. a loss of $32 for $4.00 invested in N.
D. a loss of $96 for $4.00 invested in N.

_____ 11. The marginal return from an investment may be found by
A. subtracting returns prior to the investment from returns after the investment is made.
B. adding returns before and after the investment and dividing by 2.
C. dividing returns after the investment by returns made prior to the investment.
D. subtracting the marginal cost from the marginal output.

_____ 12. According to the principle of equimarginal returns, you invest resources in such a way that
A. marginal returns from different uses tend to be unequal.
B. average returns from different uses are equal.
C. marginal returns from different uses tend to be equal.
D. the ratio between marginal returns and cost does not change.

____ 13. The principle of opportunity cost tells you that the cost of using a resource in a specific way is

A. the return that could be made by using it in the least productive way.
B. a cost which you have the opportunity to deduct from your income tax.
C. determined by the labor cost which offers the greatest opportunity for being reduced.
D. the return that could be made by using it for the most profitable alternate use.

____ 14. Fixed costs are costs that

A. change as production is increased.
B. are fixed by the suppliers of farm production needs.
C. do not change when production changes.
D. do not change unless production is increased.

____ 15. Some examples of variable farm costs are

A. taxes and interest.
B. fertilizer and fuel.
C. depreciation and building costs.
D. operators own labor and family labor.

____ 16. A manager finds that the costs for growing 100 acres of corn are - land taxes $600 - interest $2,400 - corn machinery depreciation $1,000 - and fertilizer $3,000. If the operator produced 10,000 bu. of corn, the fixed costs are

A. $.30 per bushel.
B. $.70 per bushel.
C. $.50 per bushel.
D. $.40 per bushel.

____ 17. Two products which you can produce with the same general group of resources are said to be

A. supplementary when the production of one increases at the same time that you increase production of the other.
B. competitive when the production of one increases at the same time that you increase production of the other.
C. complementary when the production of one increases at the same time that you increase production of the other.
D. complementary when the production of one decreases at the same time that you increase production of the other.

____ 18. Specialization refers to the production of only one or a few kinds of products; it has the advantage of

A. reducing the total fixed costs.
B. providing year around employment on the farm.
C. spreading fixed costs over more kinds of products.
D. spreading fixed costs over greater total production.

_____ 19. The law of comparative advantage says that individuals, firms, regions and countries tend to produce those products

A. they are best able to produce and trade them for other needed products.
B. they need most despite environmental conditions.
C. they can best sell in local and regional markets.
D. which have the lowest fixed costs.

_____ 20. A well-recognized method of reducing production and price risks is to:

A. specialize by producing the one product best adapted to natural conditions.
B. use approved farm practices in the production of a farm product.
C. purchase insurance that guarantees a profit above all production costs.
D. diversify production by producing more than one product.

STUDENT WORKSHEET #2

PRINCIPLE OF DIMINISHING RETURNS

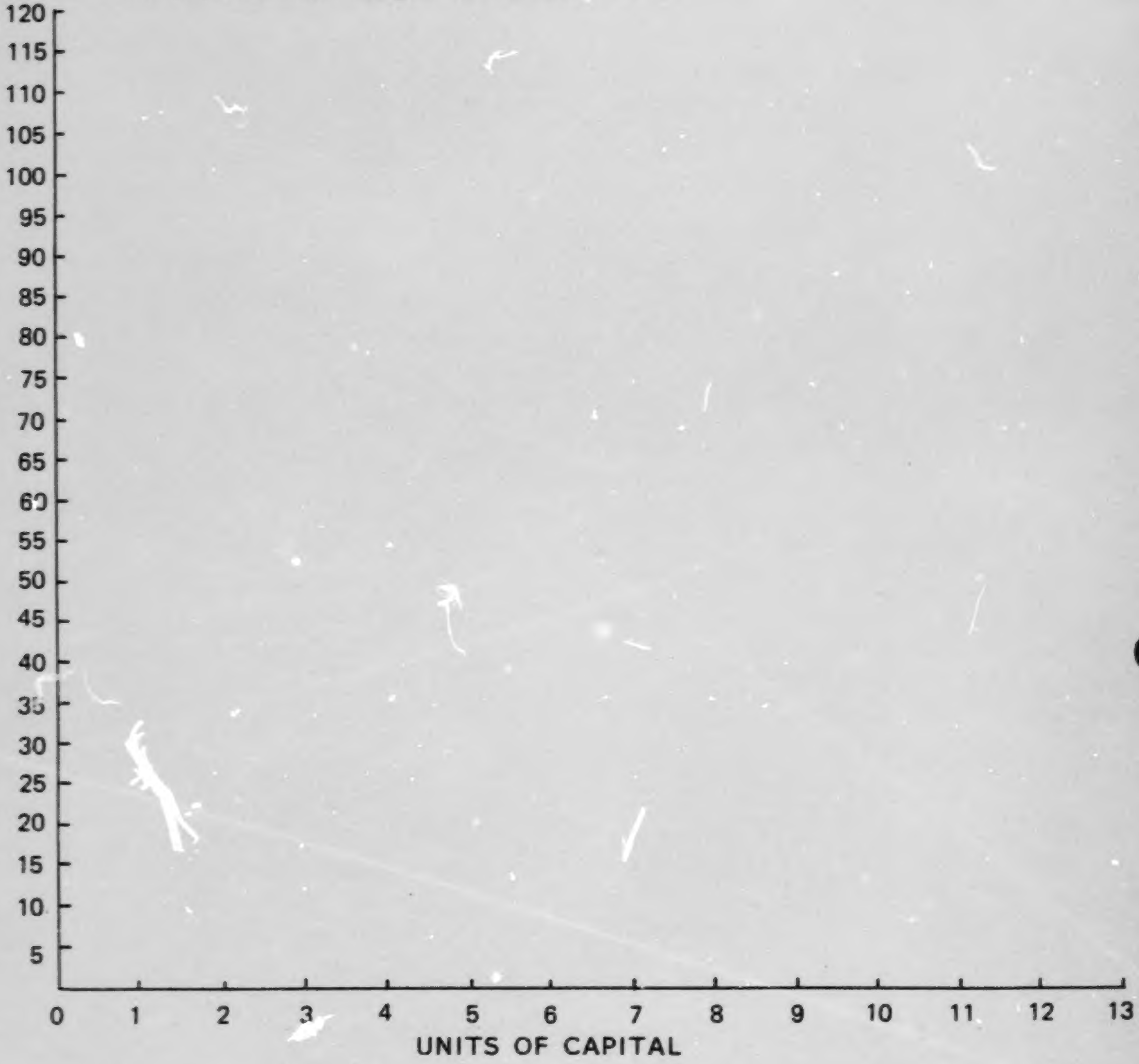
This principle is concerned with the use of varying amounts of one resource, which is added to fixed resources in producing a product.

1. Calculate the average yield and marginal yield of a crop for each added unit of capital using the chart below.

Unit of Capital	Total Yield	Average Yield	Marginal Yield
1	10		
2	23		
3	38		
4	54		
5	70		
6	85		
7	99		
8	110		
9	117		
10	120		
11	118		
12	108		

2. Using the graph below, plot the total yield, average yield, and marginal yield. Label the lines for each.

3. Identify production stages I, II, and III.



4. Which stage of production is the decision making area? Why?

5. What four relationships exist between the total yield curve, average yield curve, and marginal yield curve?

6. What additional information is needed before you can determine the most profitable point of operation?

STUDENT WORKSHEET #3

PRINCIPLE OF DIMINISHING ECONOMIC RETURNS

To find where to operate in stage II on the diminishing returns graph, you need to assign a value to the prices of the input and the product.

In this example the price of the product is $3.00 per unit and the price of the resource is $5.00 per unit.

1. Calculate the marginal return in the chart below.

Unit of Capital	Total Yield	Marginal Yield	Marginal Return at $3.00/unit
1	10	10	
2	23	13	
3	38	15	
4	54	16	
5	70	16	
6	85	15	
7	99	14	
8	110	11	
9	117	6	
10	120	3	
11	118	-2	
12	108	-10	

2. How many units of capital should be used to operate where the marginal return is just above the marginal cost per unit?

3. When would you not want to invest for peak production?

STUDENT WORKSHEET #4

PRINCIPLES OF EQUIMARGINAL RETURNS AND OPPORTUNITY COST

These principles are concerned with the allocation of a limited resource among several alternative uses in such a way that you maximize your returns.

1. A production manager has $6,000 to invest. Invest it to obtain maximum returns. Invest it in $1,000 units.

Unit	Feeder Pigs	Feeder Cattle	Crop Fertilizer
1	$1,400	$1,200	$1,500
2	$1,325	$1,150	$1,300
3	$1,250	$1,100	$1,100
4	$1,150	$1,050	$1,000
5	$1,100	$1,000	$950
6	$1,000	$950	$900

2. What are the returns from investing in the best alternative use?

3. What are the returns from investing all the capital in feeder pigs?

4. What are the returns from investing all the capital in feeder cattle?

5. What are the returns from investing all the capital in crop fertilizer?

6. What was the difference in return by using the best alternative use?

7. What is the opportunity cost for the best alternative use for:

   a. unit 2 = ________

   b. unit 4 = ________, and

   c. unit 6 = ________

TEACHER'S KEY

STUDENT WORKSHEET #1

PRINCIPLES OF PRODUCTION MANAGEMENT

(Refer to VAS Unit 2040a)

Select the most correct response to the following questions.

__A__ 1. In the production of a corn crop, the nitrogen fertilizer is properly defined in economics as
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  B. soybean meal, minerals, and machinery as resources.
  C. soybean meal, minerals, and machinery as products.
  D. hog supplements, dairy supplements, and poultry supplements as variable costs.

__C__ 3. Wealth that occurs in nature and is used in production is defined as
  A. capital.
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  B. man-made wealth used in production.
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  D. physical energy used in the productive process.

__D__ 5. In order to have capital,
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  C. it is necessary to be in business for yourself.
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D. operators own labor and family labor.

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A. $.30 per bushel.
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C. complementary when the production of one increases at the same time that you increase production of the other.
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B. they need most despite environmental conditions.
C. they can best sell in local and regional markets.
D. which have the lowest fixed costs.

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B. use approved farm practices in the production of a farm product.
C. purchase insurance that guarantees a profit above all production costs.
D. diversify production by producing more than one product.

TEACHER'S KEY

STUDENT WORKSHEET #2

PRINCIPLE OF DIMINISHING RETURNS

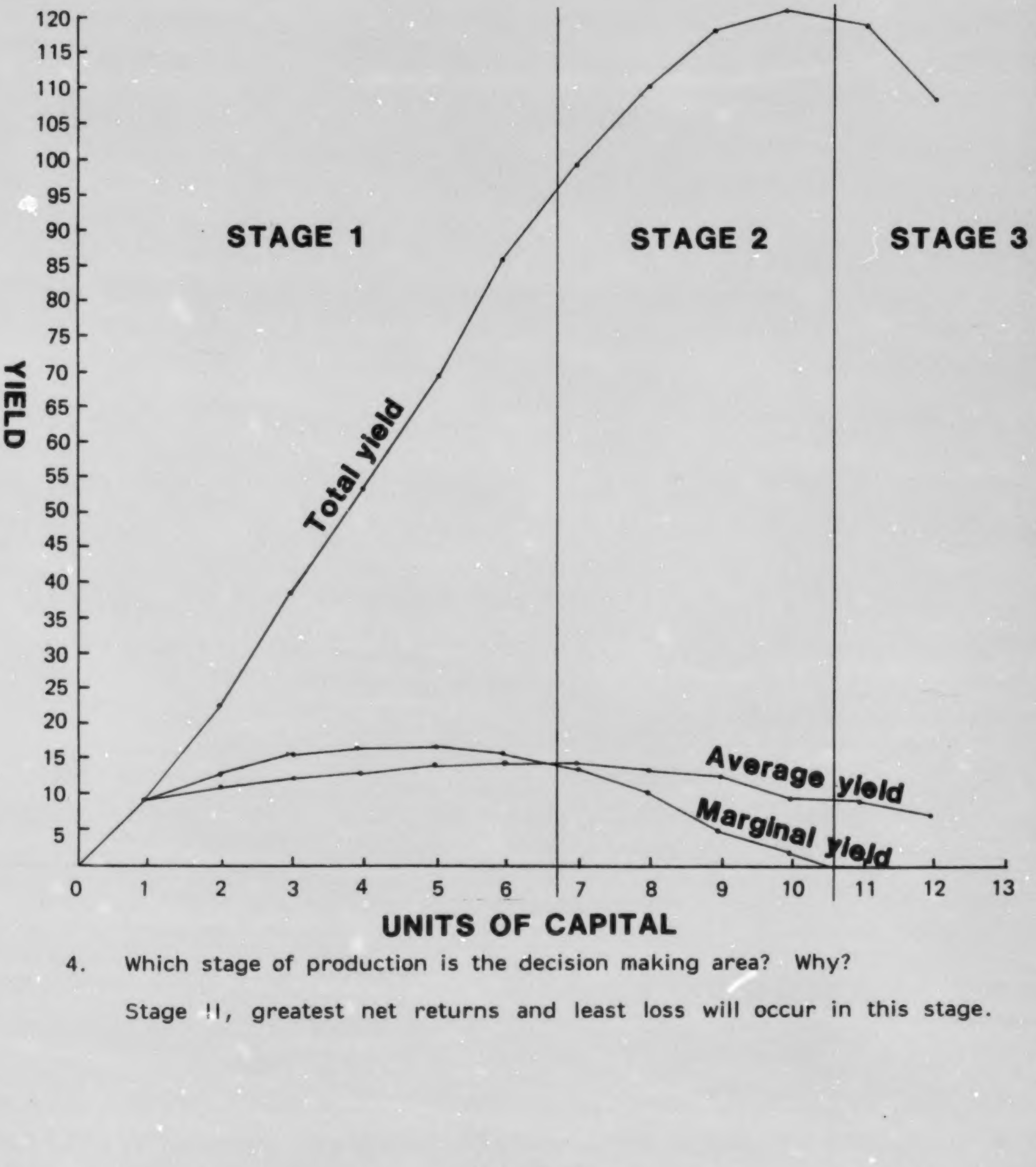
This principle is concerned with the use of varying amounts of one resource, which is added to fixed resources in producing a product.

1. Calculate the average yield and marginal yield of a crop for each added unit of capital using the chart below.

Unit of Capital	Total Yield	Average Yield	Marginal Yield
1	10	10.0	10
2	23	11.5	13
3	38	12.7	15
4	54	13.5	16
5	70	14.0	16
6	85	14.1	15
7	99	14.1	14
8	110	13.8	11
9	117	13.0	6
10	120	12.0	3
11	118	10.7	-2
12	108	9.0	-10

2. Using the graph below, plot the total yield, average yield, and marginal yield. Label the lines for each.

3. Identify production stages I, II, and III.



4. Which stage of production is the decision making area? Why?

Stage II, greatest net returns and least loss will occur in this stage.

5. What four relationships exist between the total yield curve, average yield curve, and marginal yield curve?

   a. The average yield is increasing as long as the marginal yield is above it.

   b. The marginal yield crosses the average yield at the peak of the average yield.

   c. The average yield is falling, when the marginal yield is below the average yield.

   d. The marginal yield is at zero when the total yield is at its peak.

6. What additional information is needed before you can determine the most profitable point of operation?

   The prices of the resources and products used and produced.

TEACHER'S KEY

STUDENT WORKSHEET #3

PRINCIPLE OF DIMINISHING ECONOMIC RETURNS

To find where to operate in stage II on the diminishing returns graph, you need to assign a value to the prices of the input and the product.

In this example the price of the product is $3.00 per unit and the price of the resource is $5.00 per unit.

1. Calculate the marginal return in the chart below.

Unit of Capital	Total Yield	Marginal Yield	Marginal Return at $3.00/unit
1	10	10	$30.00
2	23	13	$39.00
3	38	15	$45.00
4	54	16	$48.00
5	70	16	$48.00
6	85	15	$45.00
7	99	14	$42.00
8	110	11	$33.00
9	117	6	$18.00
10	120	3	$9.00
11	118	-2	-$6.00
12	108	-10	-$30.00

2. How many units of capital should be used to operate where the marginal return is just above the marginal cost per unit?

   You should use 10 units of capital because there is a $9.00 return for each $5.00 investment.

3. When would you not want to invest for peak production?

   a. You may have limited funds or a better place to invest the capital.
   b. Adverse conditions may be anticipated in the area of production.

TEACHER'S KEY

STUDENT WORKSHEET #4

PRINCIPLES OF EQUIMARGINAL RETURNS AND OPPORTUNITY COST

These principles are concerned with the allocation of a limited resource among several alternative uses in such a way that you maximize your returns.

1. A production manager has $6,000 to invest. Invest it to obtain maximum returns. Invest it in $1,000 units.

Unit	Feeder Pigs	Feeder Cattle	Crop Fertilizer
1	$1,400 (2)	$1,200 (6)	$1,500 (1)
2	$1,325 (3)	$1,150	$1,300 (4)
3	$1,250 (5)	$1,100	$1,100
4	$1,150	$1,050	$1,000
5	$1,100	$1,000	$950
6	$1,000	$950	$900

2. What are the returns from investing in the best alternative use?
$7,975

3. What are the returns from investing all the capital in feeder pigs?
$7,225

4. What are the returns from investing all the capital in feeder cattle?
$6,450

5. What are the returns from investing all the capital in crop fertilizer?
$6,750

6. What was the difference in return by using the best alternative use?

$7,975
7,225
$ 750 gained

7. What is the opportunity cost for the best alternative use for:

a. unit 2 = $1,325,

b. unit 4 = $1,250, and

c. unit 6 = $1,150

INDIVIDUALS WHO PERFORM MANAGEMENT FUNCTIONS IN PRODUCTION AGRICULTURE

Farm operators and spouses

Farm lending organization personnel

Landlords

County extension agents, vocational agriculture instructors, government agency personnel, and others

Agriculture field representatives

Professional farm managers

TYPES OF PRODUCTION MANAGEMENT DECISIONS

What to produce

How much to produce

Kinds and amounts of resources to use

Technology to use

When and where to buy and sell

How to finance

CHARACTERISTICS OF HIGH-RANKING PRODUCERS

Takes pride in work

Ambitious

Plans work

Has "know-how" for modern production methods

Spends money wisely

Thinks things through before acting

Makes good investments

CHARACTERISTICS OF LOW-RANKING PRODUCERS

Easy going personality

Does not keep good , accurate records

Uses poor planning with production methods

Knows of modern techniques but uses old methods

Not self motivating, needs a supervisor or boss

Satisfied with just enough to get by on

Not truly interested in production agriculture

TRANSPARENCY DISCUSSION GUIDE

UNDERSTANDING AND USING BASIC ECONOMIC PRINCIPLES

Transparency--INDIVIDUALS WHO PERFORM MANAGEMENT FUNCTIONS IN PRODUCTION AGRICULTURE

A. Use this transparency to point out the variety of occupations which have an interest in production agriculture.

B. Have students provide other occupations to add to this list.

C. Discuss the degree of management input each individual would generally provide to a typical production business.

Transparency--TYPES OF PRODUCTION MANAGEMENT DECISIONS

A. Use this transparency to help students understand the scope and importance of management.

B. Have students identify various individual occupations which are involved in making these management decisions.

C. Have students identify other common management decisions to add to this list.

D. Provide practical examples for each of the listed decision questions for clarity and understanding.

Transparencies--CHARACTERISTICS OF HIGH-RANKING PRODUCERS and CHARACTERISTICS OF LOW-RANKING PRODUCERS

A. Use these transparencies to point out that not all people make good managers.

B. Have students evaluate their own management characteristics.

C. Develop a "fictional" manager as an example to provide practical, everyday situations to show how these characteristics surface.

D. Relate these characteristics and management decisions to the students' S.O.E.P.

TEACHER'S KEY
SAMPLE TEST QUESTIONS
UNDERSTANDING AND USING BASIC ECONOMIC PRINCIPLES

PART I. True (+) or False (0)

+ 1. Something that is a product at one time may become a resource at another.

+ 2. Economic principles provide short cuts in decision making.

0 3. Land is often described as stored wealth.

0 4. When using the principle of diminishing returns, it can be said that the average product is rising when the marginal product is below it.

0 5. Examples of fixed production costs are fertilizer, fuel, seed, and hired labor.

+ 6. Diversification tends to reduce production risks.

+ 7. A favorable demand must exist if a product is to have a favorable comparative advantage.

+ 8. An advantage of specialization is the ability to spread the fixed costs over many units of the same product.

+ 9. Nonfarm businesses are affected more by government regulation regarding labor than is true for farmers.

+ 10. In farming, labor and management are often performed by the same person.

PART II. Multiple Choice

C 1. A resource which includes all wealth that occurs in nature and is used in production is:

A. capital.
B. labor.
C. land.
D. management.

A 2. A resource which is man-made wealth rather than found in nature is:

A. capital.
B. labor.
C. land.
D. management.

A 3. A management principle which states that as a variable resource is added to fixed resources, marginal output declines immediately or after an initial stage of increasing marginal returns is:

A. diminishing returns.
B. equimarginal returns.
C. opportunity costs.
D. resource substitution.

C 4. A management principle which states that the cost of using a resource in one way is the return that would be obtained from using it in its most profitable alternative use is:

A. diminishing returns.
B. equimarginal returns.
C. opportunity costs.
D. resource substitution.

D 5. Operating costs which are influenced by the units of production are termed:

A. economic costs.
B. fixed costs.
C. opportunity costs.
D. variable costs.

C 6. The exchange of one output for another such as forage for grain is a management principle known as:

A. comparative advantage.
B. diminishing resources.
C. product substitution.
D. resource substitution.

C 7. The change in product which results from adding another unit of resource is known as the:

A. average product.
B. comparative product.
C. marginal product.
D. total product.

D 8. The management term used to describe all of a product output is:

A. average product.
B. comparative product.
C. marginal product.
D. total product.

C 9. In a feed manufacturing plant, an example of a resource is:

A. cattle supplement mix.
B. hog supplement mix.
C. vitamin mix.
D. all the above.

B 10. A management principle which refers to the production of a number of product lines is:

A. break-even analysis.
B. diversification.
C. specialization.
D. total product.

PART III. Matching

Column A

F 1. Specialization
B 2. Labor
C 3. Comparative advantage
E 4. Management
H 5. Resource
J 6. Equimarginal return
G 7. Average product
A 8. Fixed costs
I 9. Break-even analysis
D 10. Resource substitution

Column B

A. overhead costs.
B. physical energy used in production.
C. firm or region producing what it is best able to produce.
D. combining or substituting two resources in varying amounts.
E. decision making within an organization.
F. production of only one or a few lines of products.
G. dividing total product by the number of resource units.
H. an item used in the production of a product.
I. volume needed in order to pay for all costs.
J. allocating a resource among several alternatives so the marginal returns are equal in all uses.

PART IV. Completion

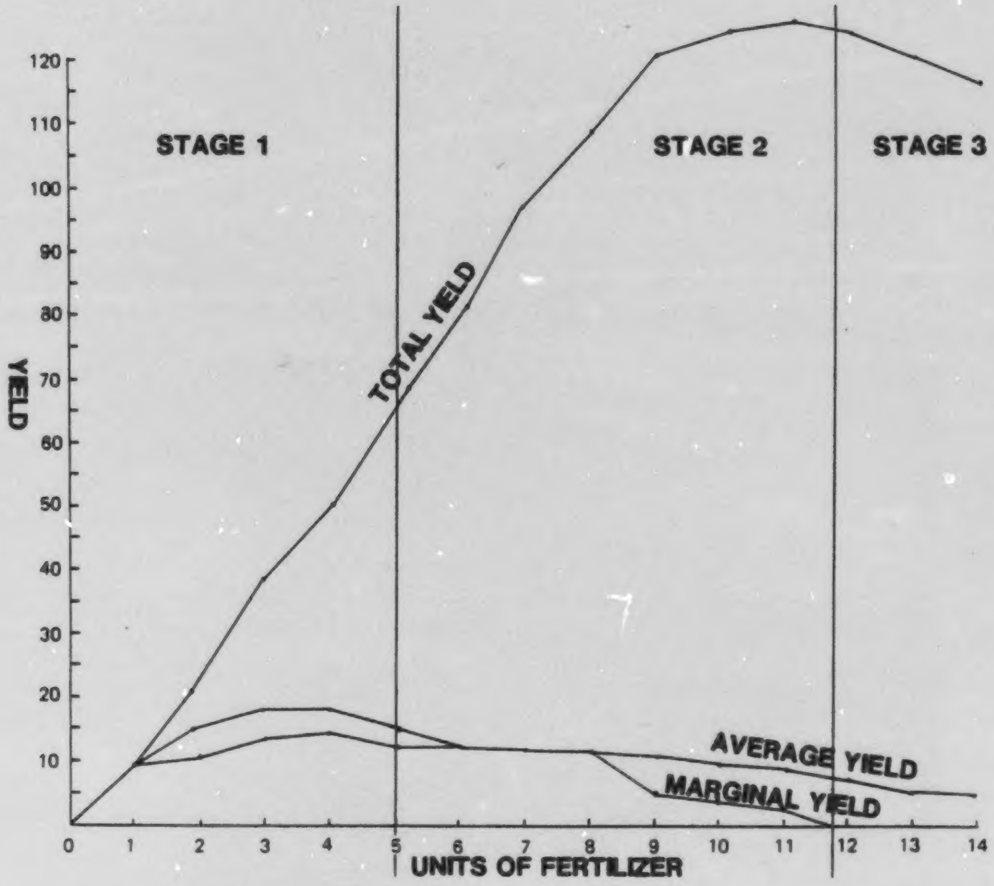
A. Diminishing Returns

1. Complete the following table to calculate the value per acre of a corn crop using varying amounts of fertilizer. Use the following values:

corn = $3.00 per bushel.
expenses = $5.00 per unit of fertilizer plus $200.00 per acre fixed costs.

Units of Input/AC	Total Yield	Average Yield	Marginal Yield	Marginal Returns	Value of Crop	Total Expenses	Net Return Per Acre
1	8	8	8	$24	$24	$205	-$181
2	22	11	14	$42	$66	$210	-$144
3	39	13	17	$51	$117	$215	-$98
4	56	14	17	$51	$168	$220	-$52
5	70	14	14	$42	$210	$225	-$15
6	84	14	14	$42	$252	$230	+$22
7	98	14	14	$42	$294	$235	+$59
8	112	14	14	$42	$336	$240	+$96
9	117	13	5	$15	$351	$245	+$106
10	120	12	3	$9	$360	$250	+$110
11	121	11	1	$3	$363	$255	+$108
12	120	10	-1	-$3	$360	$260	+$100
13	117	9	-3	-$9	$351	$265	+$86
14	112	8	-5	-$15	$336	$270	+$66

2. On the graph below, plot the total yield, average yield, and marginal yield. Label the three curves that you plot on the diminishing returns graph.



3. On the above chart, plot the three stages of production and label them.

4. In normal cases, the stage of production is II.

5. For maximum returns on the above chart you should produce at Unit #10.

B. Equimarginal Returns

1. You have $3,000 to invest in fertilizer. It is to be used in $600 units. Apply the correct number of units so you will obtain maximum returns per unit.

Unit	Field-A	Field-B	Field-C
1	$1,000 (1)	$850 (4)	$900 (3)
2	$960 (2)	$800	$825 (5)
3	$775	$650	$750
4	$730	$575	$700
5	$680	$500	$575

2. What was the difference in return by using the best alternative method rather than putting all measures in the most productive field.

$ 4535	Best Alternative
4145	Field A
$ 390	Gain

PART V. Essay

1. Briefly discuss the major advantages and disadvantages of product specialization.

(Refer to VAS Unit 2040a, part 5)

2. Briefly discuss the factors which could prevent a farmer from operating at the peak of maximum product efficiency or highest net return.

(Refer to VAS Unit 2040a, part 2)

UNIT I: AGRICULTURAL BUSINESS MANAGEMENT

PROBLEM AREA: MANAGING CREDIT IN AGRICULTURE

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during the winter months when individuals are making plans for a new fiscal year in their agribusiness.

The estimated instructional time for this problem area is 5 to 7 days depending on how far the teacher wishes to go in developing knowledge and skill in using credit. If the students are to be involved in other exercises, the instructional time will need to be increased.

This problem area was written with the following assumptions:

1. Students will have completed an instructional unit on recordkeeping.
2. Students will have completed a summary and analysis of a set of records from an agricultural enterprise.
3. Students will have already received instruction on net worth statements, cash flow statements, and other basic financial summaries which are available from Vocational Agriculture Service, University of Illinois.

Instructors are encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-24-D-0362-466 with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, student worksheets, transparency discussion guide, and sample test questions were developed by Jerry Pepple, Department of Vocational and Technical Education, University of Illinois.

The artwork in this problem area was prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture instructors:

Steve Launius - Central High School
Tom Hand - Kinderhook High School
David Erickson - R.O.V.A. High School
Don Miller - New Holland High School

TEACHER'S GUIDE

I. Unit: Agricultural business management

II. Problem area: Managing credit in agriculture

III. Objectives: At the close of this problem area students will be able to:

1. Identify the major sources of agricultural credit according to the types of loans they provide.
2. Name the characteristics a lender looks for in a borrower.
3. Name the characteristics a borrower looks for in a lender.
4. Explain the basic rules for sound and wise use of credit.
5. Compare the differences between a good and a poor credit risk.
6. Understand the steps involved in obtaining credit.
7. Identify and correctly fill out commonly used agricultural credit instruments.

IV. Suggested interest approaches:

1. Distribute several different credit instruments and ask students to name them and ask if they have used any of the instruments.
2. Start class discussion by raising the following questions with the class:
   a. What is credit?
   b. Why do people use credit?
   c. Why are some people against using credit?
3. Ask the class if any of them have ever used credit and if so, what were the circumstances.
4. Ask the students to list the things they would require before giving someone or a business credit.
5. Ask the class to respond to the statement, "It takes money to make money."
6. Have the class develop a list of businesses which issue credit to their customers. Promote class discussion on why this is such a common practice today versus one hundred years ago in America.

7. Locate a recent magazine article on the national deficit, discuss this amount of borrowing within the federal government and how it influences the use of credit.

V. Anticipated problems and concerns of students:

1. What is credit?
2. What are some sources of credit?
3. What is a good borrower?
4. What is a good lender?
5. What are some guidelines for the wise use of credit?
6. What is a sound lending practice to follow?
7. What are the steps in obtaining credit?
8. What are some common credit instruments?
9. How can I figure out the cost of using credit?
10. What can happen if I do not pay back a loan on time?

VI. Suggested learning activities and experiences:

1. Select and conduct an interest approach when beginning the instructional phase of this problem area.
2. Have students develop a list of their problems and concerns on credit management.
3. Review their list of problems and add other problems and concerns to adequately cover the information which will be taught.
4. Conduct a discussion of the problems and concerns and reorder them, if necessary, so they are in a teachable sequence.
5. Provide references to students and conduct supervised study so students can locate possible solutions to the problems which are not yet solved.
6. Select student worksheets included in this problem area and develop supplementary materials to help students understand the concepts discussed in class.
7. Locate and distribute additional credit forms and information used by local agricultural businesses which issue credit to customers. Discuss how these forms are used and identify important information a borrower should be aware of.

8. Teach the problem area, "Utilizing Local, State, and Federal Agricultural Agencies and Resources," immediately ahead of this problem area for information on government agencies.

9. Have students complete sample forms which are used when applying for credit. Let students role-play situations in making credit applications.

10. Invite a loan officer from a local financial institution to speak to the class on applying for, and the wise use of credit in todays' society.

11. Organize a field trip to a lending institution and have students practice making loan applications so they get a better understanding of credit risks.

12. Review and/or define the following terms related to credit.

    a. safe loan
    b. sound loan
    c. collateral
    d. short term credit
    e. long term credit
    f. interest cost

13. Have class members review their S.O.E. programs and evaluate possible areas where additional capital would be beneficial if credit was available.

VII. Application procedures:

1. Have students identify possible short-term and long-term credit needs for their S.O.E. program.

2. Have students develop a list of procedures for establishing themselves as a good credit risk.

VIII. Evaluation:

1. Evaluate student contributions to class discussion and problem solving.

2. Grade written exercises and worksheets.

3. Administer pencil and paper test over important concepts.

4. Evaluate student participation in out-of-class assignments.

IX. References and aids:

Vocational Agriculture Service, College of Agriculture, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois 61801.

1. VAS Unit 2027b, Sources of Farm Credit.
2. VAS Unit 2028b, Factors Involved in the Borrowing Process.
3. VAS Unit 6007, Agricultural Credit Instruments.

Other credit references not used in the problem area:

1. VAS Unit 2024b, Using Credit to Increase Farm Earnings.
2. VAS Unit 2025b, Determining Credit Needs on the Farm.
3. VAS Unit 2026b, Planning for Repayment of Loans.
4. VAS Unit 2033a, Using Farm Real Estate Loans.
5. Rural Core IV Problem Area, "Utilizing Local, State, and Federal Agricultural Agencies and Resources."

COMPETENCY INVENTORY

MANAGING CREDIT IN AGRICULTURE

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

	Competency	Circle One						
1.	Develop a sound credit policy for business operation.	1	2	3	4	5		
2.	Evaluate financial statements to determine credit risks of selected business operations.	1	2	3	4	5		
3.	Compute the cost of using credit.	1	2	3	4	5		
4.	Identify and recommend sources of credit for selected situations.	1	2	3	4	5		
5.	Complete an application for credit using selected credit instruments.	1	2	3	4	5		
6.	Properly define commonly used credit terms.						6	7
7.	Explain uses of long-term, intermediate, and short-term loans.						6	7
8.	Properly complete selected credit instruments.						6	7

These competencies are outlined in the National Ag Occupations Competency Study, 1978, for entry level positions in agriculture.

Name ______________________ Date ______________

INFORMATION SHEET

CREDIT TERMS*

AMORITIZATION - The repayment of a loan with a regular series of payments over a specified period of time.

ASSETS - Items or resources controlled by the firm.

BUDGET - A schedule of expected returns and costs. An enterprise budget shows the expected returns and costs associated with a specific production activity (e.g. soybeans) while a whole farm budget shows the expected returns and costs associated with all the enterprises on the farm (see examples of enterprise budgets following these definitions).

CAPITAL - An aggregation of economic goods used to promote the production of other goods.

CAPITAL ASSET - All property owned and used for personal purposes, pleasure or investment.

CAPITALIZATION - Process for placing a value on an asset based on its future earning power and the expected interest rate.

CASH FLOW - The cash received and cash spent during an accounting period. When calculated over several periods, cash flow illustrates the flow of and requirements for cash over time.

COLLATERAL - Livestock, land and other personal property used to secure the loan.

COMPOUNDING - The process of calculating and adding interest to a principal amount so that the principal increases over time. For example, $100.00 placed in a savings account paying 5.5 percent interest will be worth $105.50 one year later and $111.30 two years later if interest is compounded annually.

COST OF PRODUCTION - Monetary outlay for the fixed and variable input factors needed to obtain output.

CURRENT ASSETS - Cash, marketable securities, accounts and notes receivable, prepaid expenses, and inventories which are expected to be converted to cash during the next year.

CURRENT LIABILITIES - Debt payments which must be paid within the next year.

CURRENT RATIO - Current assets divided by current liabilities.

DEBT EQUITY RATIO - Total debt or liabilities divided by owner equity or net worth.

DISCOUNTED INTEREST - Interest is deducted from principal at the time the loan is made.

DISCOUNTING - The opposite procedure from compounding. Discounting can be used to determine the amount of money which must be invested today in order to have a specified amount at some time in the future. For example, discounting $105.50 which you wish to withdraw from a savings account one year from now reveals that you must deposit $100 today if the interest rate is 5.5 percent.

FIXED ASSETS - Land, buildings and other permanent improvements.

FIXED COST - A cost incurred by the firm which does not vary with the level of production in the short run. (In the long run there are no fixed costs.) Examples of fixed costs are depreciation, taxes, insurance and interest on investments.

FIXED INPUT (or resource) - A factor whose quantity is given and does not vary with the level of production in the short run. (In the long run there are no fixed inputs.)

INCOME STATEMENT - A financial statement which lists the cash and non-cash receipts and expenses of a firm during a specified period of time, usually a year. Also called a profit-and-loss statement or an operating statement.

INPUT - A factor of production or basic resource; may be fixed or variable in nature.

INTEREST - Charge for use of money.

INTEREST RATE - Percentage charged for the use of money.

INTERMEDIATE ASSETS - Shortlived depreciable assets, such as motor vehicles, machinery and breeding stock.

INTERMEDIATE LIABILITIES - Loans with maturities of greater than one year and up to 10 years in length.

INVENTORY - An itemized list of goods on hand with their estimated worth.

INVESTMENT - The laying out of funds for the building of stocks in a business with the view of obtaining an income or profit.

INVESTMENT TAX CREDIT - A credit against or reduction in federal income tax equal to 10 percent of qualified investments.

LEVERAGE - Using borrowed capital to make equity capital go further.

LIABILITIES - Financial claims against the firm.

LIABILITY - A claim against an individual to compensate a second person for a physical injury of an economic loss caused by the negligence of the first individual.

LIMITED CAPITAL - One or more of the factors of production is limited because of lack of enough available capital.

LONG-TERM LIABILITIES - Loans for land, buildings and other permanent improvements that have maturities greater than 10 years.

MORTGAGE - The use of property, usually real estate, as collateral for a loan.

NET CAPITAL RATIO - Total assets divided by total liabilities.

NET RETURNS - The financial returns after all costs have been paid.

NET WORTH - The difference between total assets and total liabilities. Also called owner's equity.

NET WORTH STATEMENT - A financial statement which lists the assets and liabilities of a firm at a particular time, usually at the end of the accounting year. Also called a balance sheet.

PRINCIPAL - An amount of money borrowed or invested.

PRODUCTION COSTS - The value of the resources used to obtain output.

PROFIT - The excess of returns over expenditures (accounting concept). The excess after payments have been made to all factors of production (economic concept).

QUICK RATIO (ACID TEST) - Cash and receivables divided by current liabilities.

RE-SEAL - A term referring to the extension of storage of grain for recourse of an extended commodity credit loan.

RESOURCES - All the inputs used in the production process.

RETURN ON INVESTMENT - The income or profit realized from an investment.

SIMPLE INTEREST - Product of the principal, the time in years and the annual rate of interest.

TOTAL COST - The sum of the cost of variable inputs and the cost of the fixed inputs at any given level of production.

TOTAL REVENUE - Revenue obtained from the sale of output; found by multiplying the price per unit by the number of units sold.

TOTAL VARIABLE COST - The cost of the variable inputs.

UNIT OF INPUT - A factor of production or basic resource. It may be fixed or variable in nature.

UNIT OF OUTPUT - Unit of production resulting from the combination of variable and fixed inputs.

VARIABLE COSTS - Those operating costs which change directly with the level of production because of the different amounts of the variable input which are needed at different levels of output. Examples are feed, seed, fertilizer and fuel.

VARIABLE INPUT - An input whose usage varies with the level of production. See Variable Costs.

WORKING CAPITAL - Current assets minus current liabilities.

*Selected from National FFA Contests, Bulletin No. 4, 1982/1983/1984, pages 26-32, Kansas City, Missouri.

STUDENT WORKSHEET #1

SOURCES OF FARM CREDIT

(Refer to VAS Unit 2027b)

1. The three main channels of credit available to individuals are ________, __________, and _________________________.

2. Real-estate credit is _________ and nonreal-estate credit is generally __________.

3. Real-estate credit is usually secured by ______________________________ ____________.

4. Short-term credit can generally be obtained from what sources?

5. Long-term credit can generally be obtained from what sources?

6. The formula for determining the actual annual interest rate of an installment loan is:

7. What could be a major problem in borrowing from individuals for production credit?

8. An individual purchased a piece of agricultural machinery and financed $4,000 of it for five years. Interest charges amounted to $1,900. The buyer will make two payments per year. What rate of interest is actually being paid?

9. Anyone obtaining a loan from a Federal Land Bank must subscribe to what requirement?

10. Under what conditions can individuals borrow from FHA?

11. What factors should a lender look for in a borrower?

12. What factors should a borrower look for in a lender.

13. Which of the following individuals would you, as a lender, loan money to and why? The following show financial statements for individuals A and B.

Assets	Individual A	Individual B
Cash	$ 600	$ 2,700
Saving account	$ 2,400	$ 3,900
Personal property	$ 5,800	$ 6,300
Machinery	$ 5,000	$ 5,600
Land	$30,000	----
TOTAL	$43,800	$18,500
Liabilities		
Installment loans	$ 500	$ 100
Unpaid taxes	$ 400	----
Personal loan	$ 5,400	----
Mortgage loan	$22,000	----
TOTAL	$28,300	$ 100
Net Worth	$15,500	$18,400

STUDENT WORKSHEET #2

THE BORROWING PROCESS

(Refer to VAS Unit, 2028b)

1. Why does borrowing increase risk more for a borrower than a lender?

2. What is consumer credit?

3. What are ten rules for sound and wise use of credit?

4. How do price trends affect loans?

5. What should be done if you see that you can't meet a payment?

6. What is the order of claims on production income?

7. Why should repayment of short-term loans come before taxes, interest, and long-term debts?

8. Explain the following equation:

C + NW = safe loan,
C + NW + CP = sound loan

9. What are the three steps in obtaining credit?

10. How does use of credit for consumer goods affect borrowing for production purposes?

STUDENT WORKSHEET #3

CREDIT INSTRUMENTS

(Refer to VAS Unit 6007)

____ 1. A written record showing proof that a loan has been made is called:

A. a quit-claim deed
B. a bill of sale
C. a credit instrument
D. a release

____ 2. A check is an unconditional written order directing:

A. an individual to pay a certain sum to a bank
B. a bank to pay an indefinite sum to the order of a specified person or bearer
C. a bank to issue a draft for the sum stated on the check
D. a bank to pay a certain sum to the order of a specified person or bearer

____ 3. A cancelled check containing a statement of the purpose for which it was given:

A. serves as a receipt for the payment of a bill
B. is good evidence of the payment of a bill
C. is kept on file at the bank as proof of payment
D. Both A and B

____ 4. When writing a check, it is unwise to make it payable to "cash" because:

A. it is too easy to raise the sum to be paid
B. the check can be cashed by anyone
C. the check will not serve as proof of payment
D. it does not show what the check was given for

____ 5. When you receive a check it should be cashed promptly because a bank:

A. may go out of business at any time
B. is not obligated to cash a check that is over 6 months old
C. likes to keep all its accounts active
D. likes to loan its funds at all times

____ 6. If a signed check is stolen:

A. the signer may be held liable to others who normally become holders of the check
B. a stop payment order to the bank fully protects the signer
C. the signer cannot be held liable for any more money than is in the maker's bank account
D. the check will not be cashed after the signer notifies the police

____ 7. A letter of credit authorizes a buyer to draw a:

A. draft on a third party to pay for the article being purchased
B. check on the maker's bank account to pay for the article being purchased
C. draft for any article he might want to purchase
D. check to make the down payment for new farm equipment

____ 8. A note is an unconditional written promise to:

A. pay a listed sum of money at the convenience of the maker
B. perform a certain act listed in the note
C. pay a certain sum for an article offered for sale
D. pay a certain sum in money on a certain day or on demand

____ 9. Many notes contain a confession of judgment clause. This

A. permits payment of the note in monthly installments, according to the maker's judgment
B. permits the holder of the note to take judgment without a trial
C. requires the holder to pay the note on the due date
D. requires the maker of the note to issue a sight draft

____ 10. Most credit instruments are negotiable. This means:

A. the original debtor can prepay the loan
B. the debt must be paid to the original creditor
C. the original creditor or other holders can sell the instrument
D. the maker of the note can sell the instrument

____ 11. In secured transactions the person who borrows money is known:

A. as the debtor
B. as the secured party
C. as the mortgagee
D. as the pledgee

____ 12. The material given as security is known as:

A. collateral
B. consumer's goods
C. inventory items
D. security interest

____ 13. A security interest arising from transactions in farming is usually perfected by:

A. filing a financing statement in the bank making the loan
B. filing a financing statement with one of the witnesses to the agreement
C. filing a financing statement with the debtor within 60 days
D. filing a financing statement with the County Recorder of Deeds

____ 14. When two parties claim interest in the same collateral, the one who:

A. has the first security interest usually has the best claim
B. files first usually has the best claim
C. made the first loan usually has the best claim
D. made the largest loan usually has the best claim

____ 15. When foreclosed property is sold, the money received is first used to pay:

A. the claim of the secured party
B. anyone holding a lien on the property
C. the filing cost to the County Recorder
D. the cost of the repossession and sale

____ 16. When property is being foreclosed by a creditor, the debtor:

A. can redeem the property after it has been sold
B. cannot redeem the property at any time
C. can redeem the property before sale by paying debt and costs to date
D. can redeem the property and the creditor must pay the costs

____ 17. If machinery is purchased by the use of a conditional sales contract, the title:

A. passes to the buyer upon delivery of the machine
B. passes to the buyer when over 50% of cost is paid
C. does not pass to the buyer until a release is secured
D. does not pass to the buyer until the last payment is made

_____ 18. A warehouse receipt is issued by a warehouse owner to anyone who:

A. uses stored goods as collateral
B. holds a bill of lading on the stored goods
C. stores goods in a peson's warehouse
D. buys goods stored in a licensed warehouse

_____ 19. Common carriers issue a receipt or contract agreeing to deliver freight. This is called:

A. a bill of lading
B. a warehouse receipt
C. a chattel mortgage
D. a bill of sale

_____ 20. When a secured debt is repaid, the borrower should be sure that:

A. the termination statement (release) is recorded so the property can be given to the borrower
B. the termination statement (release) is sent to the lender
C. the termination statement (release) is recorded to give the borrower a good title
D. the termination statement (release) is destroyed by the county clerk

TEACHER'S KEY

STUDENT WORKSHEET #1

SOURCES OF FARM CREDIT

(Refer to VAS Unit 2027b)

1. The three main channels of credit available to individuals are private, cooperative, and governmental.
2. Real-estate credit is long-term and nonreal-estate credit is generally short-term.
3. Real-estate credit is usually secured by a mortgage on farm land and buildings.
4. Short-term credit can generally be obtained from what sources?

   a. Merchants and dealers
   b. Individuals
   c. Banks
   d. Production Credit Associations
   e. Agricultural credit corporations
   f. Farmers Home Administration
   g. Commodity Credit Corporation

5. Long-term credit can generally be obtained from what sources?

   a. Federal Land Bank
   b. Life insurance companies
   c. Farmers Home Administration
   d. Banks
   e. Individuals

6. The formula for determining the actual annual interest rate of an installment loan is:

$$\frac{\text{Total finance charges}}{\tfrac{1}{2}\text{ original loan}} \times \frac{\text{number of payments}}{\text{number of years}} \times \frac{1}{\text{number of payments plus 1}} =$$

   actual annual rate of interest

7. What could be a major problem in borrowing from individuals for production credit?

   May not be dependable source because of death or other changes in the personal or financial situation of the lender.

8. An individual purchased a piece of agricultural machinery and financed $4,000 of it for five years. Interest charges amounted to $1,900. The buyer will make two payments per year. What rate of interest is actually being paid?

$$\frac{\$1,900}{2,000} \times \frac{10}{5} \times \frac{1}{11} = 17.27\%$$

9. Anyone obtaining a loan from a Federal Land Bank must subscribe to what requirement?

   Must purchase F.L.B. stock in the local association in an amount equal to 5 percent of the loan.

10. Under what conditions can individuals borrow from FHA?

    These loans are made only to families not able to obtain credit for these purposes from other agencies. Interest rates are somewhat dependent upon the income of the family.

11. What factors should a lender look for in a borrower?

    a. Established reputation for personal responsibility and integrity.
    b. Moral responsibility to honor debts.
    c. Proven managerial ability.
    d. Continuity of management in the business.
    e. Demonstrated financial position and progress in form of net worth statement.
    f. Repayment capacity of borrower.
    g. Purpose of loan--necessity, need, or want.
    h. Security or collateral to protect the lender.

12. What factors should a borrower look for in a lender.

    a. General ability and character.
    b. Lending policies.
    c. Permanence and dependability.
    d. Experience.

13. Which of the following individuals would you, as a lender, loan money to and why? The following show financial statements for individuals A and B.

Assets	Individual A	Individual B
Cash	$ 600	$ 2,700
Saving account	$ 2,400	$ 3,900
Personal property	$ 5,800	$ 6,300
Machinery	$ 5,000	$ 5,600
Land	$30,000	----
TOTAL	$43,800	$18,500
Liabilities		
Installment loans	$ 500	$ 100
Unpaid taxes	$ 400	----
Personal loan	$ 5,400	----
Mortgage loan	$22,000	----
TOTAL	$28,300	$ 100
Net Worth	$15,500	$18,400

TEACHER'S KEY

STUDENT WORKSHEET #2

THE BORROWING PROCESS

(Refer to VAS Unit, 2028b)

1. Why does borrowing increase risk more for a borrower than a lender?

   A borrower stands to lose his or her accumulated savings should the "breaks of the game" turn against the borrower for some unforseen reason.

2. What is consumer credit?

   Credit which is used for nonproductive purposes.

3. What are ten rules for sound and wise use of credit?

   a. Use production loans only for something that will increase income.

   b. Borrow for enterprises you understand.

   c. Keep debts as low as possible without reducing efficiency.

   d. Carefully study and evaluate price trends.

   e. Keep debts in line with your net worth.

   f. Keep debts in line with your probable income.

   g. Select a dependable lender.

   h. Have a definite repayment program.

   i. Be businesslike and frank with your lender.

   j. Have adequate insurance.

4. How do price trends affect loans?

   Don't borrow too much, hoping that the seasonal high prices will stay and help pay off your loan. If prices drop, you lose your pay-off money.

5. What should be done if you see that you can't meet a payment?

   Talk to your lender as soon as you suspect a problem with meeting the due date. Be prepared to compromise with the lender on arranging a new payment schedule.

6. What is the order of claims on production income?

   a. Family living
   b. Operating expenses
   c. Taxes
   d. Interest
   e. Debt payments

7. Why should repayment of short-term loans come before taxes, interest, and long-term debts?

   Because this is considered a part of your production operating expenses.

8. Explain the following equation:

   C + NW = safe loan,
   C + NW + CP = sound loan

   C = character
   NW = net worth
   CP = capacity to pay

   A loan is safe if a borrower's character and net worth are strong enough so the lender can be confident that the loan is protected by adequate collateral.

   A loan is sound if other factors promise adequate income to repay the amount without recourse to net worth.

9. What are the three steps in obtaining credit?

   a. Consider the benefits and risks involved.

   b. Decide how to present your case to a lender.

   c. Determine what agreements should be included in the loan agreement.

10. How does use of credit for consumer goods affect borrowing for production purposes?

    a. Could jeopardize your ability to obtain sufficient credit for essential production purposes.

    b. Keep the production lender informed and seek his/her opinion before borrowing for consumer goods at another institution.

TEACHER'S KEY

STUDENT WORKSHEET #3

CREDIT INSTRUMENTS

(Refer to VAS Unit 6007)

C 1. A written record showing proof that a loan has been made is called:

A. a quit-claim deed
B. a bill of sale
C. a credit instrument
D. a release

D 2. A check is an unconditional written order directing:

A. an individual to pay a certain sum to a bank
B. a bank to pay an indefinite sum to the order of a specified person or bearer
C. a bank to issue a draft for the sum stated on the check
D. a bank to pay a certain sum to the order of a specified person or bearer

D 3. A cancelled check containing a statement of the purpose for which it was given:

A. serves as a receipt for the payment of a bill
B. is good evidence of the payment of a bill
C. is kept on file at the bank as proof of payment
D. both A and B

B 4. When writing a check, it is unwise to make it payable to "cash" because:

A. it is too easy to raise the sum to be paid
B. the check can be cashed by anyone
C. the check will not serve as proof of payment
D. it does not show what the check was given for

B 5. When you receive a check it should be cashed promptly because a bank:

A. may go out of business at any time
B. is not obligated to cash a check that is over 6 months old
C. likes to keep all its accounts active
D. likes to loan its funds at all times

A 6. If a signed check is stolen:

- A. the signer may be held liable to others who normally become holders of the check
- B. a stop payment order to the bank fully protects the signer
- C. the signer cannot be held liable for any more money than is in the maker's bank account
- D. the check will not be cashed after the signer notifies the police

A 7. A letter of credit authorizes a buyer to draw a:

- A. draft on a third party to pay for the article being purchased
- B. check on the maker's bank account to pay for the article being purchased
- C. draft for any article he might want to purchase
- D. check to make the down payment for new farm equipment

D 8. A note is an unconditional written promise to:

- A. pay a listed sum of money at the convenience of the maker
- B. perform a certain act listed in the note
- C. pay a certain sum for an article offered for sale
- D. pay a certain sum in money on a certain day or on demand

B 9. Many notes contain a confession of judgment clause. This

- A. permits payment of the note in monthly installments, according to the maker's judgment
- B. permits the holder of the note to take judgment without a trial
- C. requires the holder to pay the note on the due date
- D. requires the maker of the note to issue a sight draft

C 10. Most credit instruments are negotiable. This means:

- A. the original debtor can prepay the loan
- B. the debt must be paid to the original creditor
- C. the original creditor or other holders can sell the instrument
- D. the maker of the note can sell the instrument

A 11. In secured transactions the person who borrows money is known:

- A. as the debtor
- B. as the secured party
- C. as the mortgagee
- D. as the pledgee

A 12. The material given as security is known as:

A. collateral
B. consumer's goods
C. inventory items
D. security interest

D 13. A security interest arising from transactions in farming is usually perfected by:

A. filing a financing statement in the bank making the loan
B. filing a financing statement with one of the witnesses to the agreement
C. filing a financing statement with the debtor within 60 days
D. filing a financing statement with the County Recorder of Deeds

B 14. When two parties claim interest in the same collateral, the one who:

A. has the first security interest usually has the best claim
B. files first usually has the best claim
C. made the first loan usually has the best claim
D. made the largest loan usually has the best claim

D 15. When foreclosed property is sold, the money received is first used to pay:

A. the claim of the secured party
B. anyone holding a lien on the property
C. the filing cost to the County Recorder
D. the cost of the repossession and sale

C 16. When property is being foreclosed by a creditor, the debtor:

A. can redeem the property after it has been sold
B. cannot redeem the property at any time
C. can redeem the property before sale by paying debt and costs to date
D. can redeem the property and the creditor must pay the costs

D 17. If machinery is purchased by the use of a conditional sales contract, the title:

A. passes to the buyer upon delivery of the machine
B. passes to the buyer when over 50% of cost is paid
C. does not pass to the buyer until a release is secured
D. does not pass to the buyer until the last payment is made

C 18. A warehouse receipt is issued by a warehouse owner to anyone who:

A. uses stored goods as collateral
B. holds a bill of lading on the stored goods
C. stores goods in a peson's warehouse
D. buys goods stored in a licensed warehouse

A 19. Common carriers issue a receipt or contract agreeing to deliver freight. This is called:

A. a bill of lading
B. a warehouse receipt
C. a chattel mortgage
D. a bill of sale

C 20. When a secured debt is repaid, the borrower should be sure that:

A. the termination statement (release) is recorded so the property can be given to the borrower
B. the termination statement (release) is sent to the lender
C. the termination statement (release) is recorded to give the borrower a good title
D. the termination statement (release) is destroyed by the county clerk

COMMONLY USED AGRICULTURE CREDIT INSTRUMENTS

Checks

Drafts

Warehouse receipts

Bills of lading

Security agreements

Promissory notes

ESTABLISHING A BASIS FOR CREDIT

C + NW = SAFE LOAN

C + NW + CP = SOUND LOAN

C = character, personal factor

NW = net worth, financial statement

CP = capacity to pay, income in excess of expenses

RULES FOR SOUND AND WISE USE OF CREDIT

Use production loans for things that increase income

Borrow for enterprises you are knowledgeable about

Keep debts low as possible without reducing efficiency

Study price trends

Keep debts in line with your net worth

Keep debts in line with probable income

Select a dependable lender

Establish definite repayment program

Be business-like and fair with your lender

Obtain adequate insurance

SOME FACTORS A LENDER LOOKS FOR IN A BORROWER

PERSON FACTOR

Moral responsibility
Managerial ability
Continuity of management
Character

REPAYMENT CAPACITY

There is a direct relationship between repayment capacity and amount of credit

FINANCIAL STRENGTH

Ability to withstand unexpected adverse conditions

PURPOSE OF LOAN

Loan will help you make money and not get you deeper in debt

COLLATERAL

Security of loan, what is available to back up the loan

PREPARING TO SEE A LENDER

BALANCE SHEET

Shows your financial strength, asset distribution, amount of debts

PROFIT-LOSS STATEMENT

Shows your earning capacity and ability to repay the loan

CASH FLOW BUDGET

Projects your cash flow needs and how much cash will be available for principal and interest payments

DECREASING YOUR CREDIT RISK

Increase income and savings

Produce a stable and dependable income

Diversification of income

Flexibility in uses of income

Contracts to define obligations

Insurance to cover debts

Develop strong credit rating

Maintain ability to reduce living expenses

Build equity

TEACHER'S KEY

SAMPLE TEST QUESTIONS

MANAGING CREDIT IN AGRICULTURE

PART I. True (+) - False (0)

+ 1. Private lenders are the oldest source of agricultural credit.

+ 2. Production credit is for short-term or intermediate, non-real estate uses.

0 3. Merchants and dealers of farm supplies seldom extend short-term credit without a written agreement.

+ 4. In order to borrow from a P.C.A. you must be a Class B stockholder.

0 5. Local Production Credit Associations obtain their credit funds directly from Wall Street money markets.

0 6. The Farmers Home Administration has experienced many losses by extending credit to low income, high-risk farmers.

+ 7. Federal Land Bank loans range from 5 to 40 year terms with a privilege of early repayment.

0 8. All production mortgage loans by insurance companies are for short terms - 5 years or less.

+ 9. Individual loans for sale of real estate often take the form of sale on contract by owners who don't want all of their money out of the agribusiness at once.

+ 10. The basis of "credit" is mutual confidence between lender and borrower.

+ 11. The character of the borrower is, to an extent, a subjective element of determination by the lender.

0 12. Agricultural producers with a good percentage of their assets in land are always the best loan risk.

+ 13. Repayment capacity is judged by (analyzing) the borrowers operation and financial management results.

0 14. Refinancing is what a borrower should do whenever a better rate of interest is available from another lender.

0 15. The key factor for a borrower to judge in a lender is the lending policy - "Will the lender give you a loan?"

0 16. Agricultural-production loans should be used for any purpose that increases equity regardless of its income producing capacity.

+ 17. If you have never raised hogs you should avoid borrowing money to build a confinement hog building.

+ 18. By using credit only for purposes that will bring a high return for each dollar borrowed you will increase credit efficiency.

0 19. You should ignore price trends and projections if you can make a good credit deal at the moment.

+ 20. Net worth is the difference between what you own and what you owe.

0 21. Debts should be kept in line with your total equity, not annual income.

+ 22. It pays to "shop around" for a good lender.

+ 23. Production loans should be repaid with proceeds from the crop or livestock for which the money was used.

0 24. If you can't make a loan payment and tell your lender that fact, the lender is unlikely to ever grant you another loan in the future.

+ 25. As your borrowing increases so should your term insurance coverage.

0 26. Lenders expect debt repayment to be the top priority for a borrower's annual income.

0 27. Depreciation allowances should be used for family living expenses.

+ 28. The individual family is an important aspect of determining a good credit risk.

0 29. The land and production plan seeks to evaluate only a borrowers conservation and land use practices.

+ 30. Accurate and detailed agribusiness records provide an excellent basis for the lender's evaluation of a farmer as a good or bad credit risk.

+ 31. A check is a signed written order on a bank to pay to the bearer a certain sum of money.

0 32. The cancelled check is considered a legal receipt for payment of a bill.

0 33. Illinois law does not allow a note or other contract to contain a confession of judgment clause.

+ 34. A person who borrows money is known as the debtor.

_\+_ 35. It is generally a good practice not to sign any credit instrument that is incomplete.

PART II. Multiple Choice (Make appropriate choice of A, B, C, and in some cases A, B, C, D, E, or F)

_C_ 1. To obtain financing for a tractor over a 3-5 year period you would seek:

A. A short-term production loan
B. A farm mortgage
C. An intermediate term loan
D. A long-term loan

_A_ 2. What institutional lender provides the greatest share of non-real estate credit in the United States?

A. Commercial Banks
B. P.C.A.'s
C. Farmers Home Administration
D. Insurance Companies

_B_ 3. What institutional lender provides the greatest share of real estate credit in Illinois?

A. Commercial Banks
B. Federal Land Banks
C. Life Insurance Companies
D. Farmers Home Administration

_F_ 4. If you needed a short-term production loan for the purchase of fertilizer you could seek credit from:

A. A commercial bank
B. A P.C.A.
C. The merchant selling the fertilizer
D. The Commodity Credit Corporation
E. All of the above
F. A, B, and C

_D_ 5. If a land owner has received a farm mortgage loan from the Farmer's Home Administration which of the following sources has the owner already likely to have contacted about a loan?

A. Commercial bank
B. Federal Land Bank
C. Life Insurance Company
D. Two or three of the above

E 6. "The man (person) factor is composed of the borrower's:

A. Moral responsiblity
B. Managerial ability
C. Continuity of management
D. Character
E. All of the above

E 7. A lender requests a borrower's net worth statement to:

A. See if there are debts outstanding
B. See if borrower has paid past debts
C. See how much personal assets the borrower owns as equity
D. All of the above
E. A and C
F. B and C

B 8. A split line of credit is:

A. Advantageous to the borrower to keep lenders bidding against each other for the borrower's business
B. Disliked by lenders because they are difficult for the borrower to manage
C. Good for borrowers who are behind in loan payments
D. All of the above

E 9. Security or collateral may be secured by a lender's use of a:

A. Mortgage
B. Financing statement
C. Lien
D. Warehouse receipt or bill of lading
E. All of the above

C 10. An experienced lender will:

A. Require security but dispense with eligibility requirements
B. Show personal knowledge of farming to sell you on individual competence
C. Provide good counsel on the borrower's credit decisions
D. A and B

D 11. Insurance coverage that a wise borrower carries includes:

A. Property
B. Life Insurance
C. Liability
D. All of the above

C 12. Profits depend upon:

A. Labor, management and low production costs
B. Efficiency of capital use
C. Capital, labor, and management

D 13. The key element that distinguishes a "safe loan" and a "sound loan" is:

A. Capital
B. Management
C. Net Worth
D. Capacity to pay

C 14. Capital expenditures by an agribusiness are paid for by:

A. Net earnings and increased equity
B. Gross earnings and credit
C. Net earnings and depreciation
D. All of the above

D 15. A person who lends money and has an interest in the personal property of the debtor is called a:

A. Credit instrument
B. Debt collector
C. Loan shark
D. Secured party

A 16. The material given as security to cover a loan is known as:

A. Collateral
B. Credit instrument
C. Foreclosure
D. Security interest

B 17. The filing of security interests arising from transactions in farming are filed with the:

A. Circuit Clerk
B. County Recorder of Deeds
C. County Assessor
D. County Treasurer

D 18. A credit instrument given by warehousemen for goods received by them for storage is called a:

A. Warehouse account
B. Warehouse bill
C. Warehouse deposit
D. Warehouse receipt

A 19. A contract or receipt signed by a common carrier for agreeing to deliver described freight to a given person at a stated time is a:

A. Bill of lading
B. Draft
C. Promissory note
D. Release

D 20. The transfer of a person's interest or right in property to another who has an interest in it is called a:

A. Bill of lading
B. Draft
C. Promissory note
D. Release

PART III. Short Answer

1. You decide to buy a new corn planter with no trade in, for $10,000. The interest rate is 10% calculated at the outset of the loan. The loan is for 3 years. Payments must be made twice a year. Using the following formula, what is the actual annual rate of interest?

Formula:

$$\frac{\text{Total Finance Chg.}}{\frac{1}{2}\text{ original loan}} \times \frac{\text{No. of payments}}{\text{No. of yrs.}} \times \frac{1}{\text{No. of payments} + 1} = \text{Actual Rate of Interest}$$

Answer: a) $10,000 x 10% x 3 yrs. = $3,000 Total Fin. Charges

b) $$\frac{\$3,000}{\$5,000} \times \frac{6}{3} \times \frac{1}{7} = 17 \text{ percent}$$

2. What are the five factors that lenders evaluate in deciding whether to grant a loan?

Answer:
1) The man (person)
2) Financial position and progress
3) Repayment capacity and program
4) Security or collateral
5) Purpose of the loan

3. Give examples of credit "necessities, needs and wants." Why would one or the other of these have priority to the lender?

(See VAS Unit 2027b, p. 11, Column 1)

4. Cite three policies of a lender that may affect the borrower's choice of a credit source.

   (See VAS Unit 2027b, p. 12, Column 1)

5. What is the difference between consumer credit and production credit?

   (See VAS Unit 2028b, part 1)

6. Explain the formula:

   C + NW = safe loan
   C + NW + CP = sound loan

   (See VAS Unit 2028b, part 2)

7. Name the three important steps in obtaining credit.

   (See VAS Unit 2028b, part 5)

8. Why is negotiability an important concept in credit instruments:

   (See VAS Unit 6007, part 2)

UNIT I: AGRICULTURAL BUSINESS MANAGEMENT

PROBLEM AREA: PLANNING AN INSURANCE PROGRAM

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during the time of the year when important agricultural activities of a seasonal nature are not being conducted.

The estimated instructional time for this problem area is 3 to 5 days depending on how far the teacher wishes to go in developing students' understanding of insurance programs.

If the students are to be involved in other exercises, the instructional time will need to be increased.

Instructors are encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

CREDIT SOURCES:

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The teachers' guide, student worksheets, job sheets, transparency discussion guide, and sample test questions were developed by Jerry D. Pepple, Department of Vocational and Technical Education, University of Illinois, and Lee West, Vocational Agriculture Instructor, Mt. Pulaski High School, Mt. Pulaski, Illinois.

The artwork in this problem area was prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture teachers:

Cedric Gowler - Centralia High School
Mike Robertson - Chrisman High School
David Erickson - R.O.V.A. High School
Mark Streit - Franklin Center High School

TEACHER'S GUIDE

I. Unit: Agricultural business management

II. Problem Area: Planning an insurance program

III. Objectives: At the close of this problem area students will be able to:

1. List the factors which should be considered when planning a life insurance program.
2. Explain the major forms of liability coverage available to individuals.
3. Identify from a list the major factors which need to be considered when planning a property insurance program.
4. Understand the importance of adequate health and disability insurance for themselves.
5. Name the kinds of crop insurance available to producers.
6. Match commonly used insurance terms with their proper definition.
7. Read and interpret selected sections of various insurance policies for individuals.

VI. Suggested interest approaches:

1. Open this problem area by asking the following lead questions:
    a. How many of you are insured? Why?
    b. Have any of you or your families ever been involved in an incident where you collected from an insurance company? Can you share any of your experience with the class?
    c. Why do some people prefer to buy insurance?
    d. Why do some people refuse to buy insurance?
2. Use selected transparencies in this problem area to show recent state and national losses, develop class discussion on the personal impact of these losses.
3. Locate local information on recent accidents where an insurance claim could have been involved. Promote class discussion on these local incidents.
4. Use a guest speaker, such as an insurance agent or lawyer, to class to discuss the importance of insurance for individuals and businesses.

V. Anticipated problems and concerns of students:

1. What is insurance?
2. Who needs insurance?
3. What kinds of insurance should individuals have on themselves?
4. How can I compare the policies sold by different companies?
5. What items should I look for in an insurance policy covering:
    a. life
    b. liability
    c. property
    d. health
    e. crop
6. What are some important insurance terms and what do they mean?
7. Where can I get information about insurance coverage?
8. How is the cost of insurance coverage determined?
9. What local companies offer insurance?
10. What is an insurance policy?
11. What is an insurance risk?
12. What type of auto insurance should I have?

VI. Suggested learning activities and experiences:

1. Develop and conduct an interest approach on insurance to develop class awareness about the importance of adequate insurance protection?
2. Have students develop a listing of their problems and concerns relating to insurance.
3. Supplement their list with additional problems and concerns to adequately cover what is to be taught.
4. Reorder the problems and concerns into teachable topics of discussion and study.
5. Distribute teaching resources such as VAS Unit 6017, Using Insurance in the Farm Business, and conduct supervised study to help students answer problems and concerns.
6. Conduct discussion of problems and concerns. Provide additional information to students which they could not find in the reference material.

7. Use the information sheets and transparencies in this problem area as a supplementary reference and suggest other sources where insurance information may be obtained.

8. Review and use the student worksheets in this problem area to give students additional exercise in understanding key insurance concepts.

9. Show and discuss VAS Slidefilm 380A, Insurance in the Farm Business, use Student Worksheet #3 based on this slidefilm to promote interest and learning.

10. Have students develop a bulletin board on agricultural accidents and insurance related issues.

11. Distribute samples of various insurance policies and ask students to answer some important questions concerning coverage, cost, riders, deductions, etc.

12. Have students work out an insurance package which they would need as a single and married person.

13. Invite a resource person to speak to the class concerning basic insurance issues for young adults.

14. Review and/or define common terms relating to insurance coverage.

15. Organize an ad hoc insurance company to negotiate a sample policy to cover possible losses to the FFA Chapter's agriculture equipment.

VII. Application procedures:

1. Have class members review and analyze their current personal insurance protection.

2. Have students evaluate their insurance coverage on their S.O.E. Program.

VIII. Evaluation:

1. Grade student worksheets and other written assignments.

2. Evaluate student participation and benefit toward class discussion.

3. Evaluate students ability to explain the essential parts of a typical policy.

4. Administer and grade a pencil and paper test.

IX. References and aids:

1. Vocational Agriculture Service, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois 61801.
    a. VAS Unit 6027, Using Insurance in the Farm Business.
    b. VAS Slidefilm 380A, Insurance in the Farm Business.
2. Contact local insurance agents for booklets and pamphlets dealing with various insurance topics.

PLANNING AN INSURANCE PROGRAM

COMPETENCY INVENTORY

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

	Competency	Circle One
1.	Plan an insurance program for an agricultural business.	1 2 3 4 5
2.	Plan an individual life insurance program.	1 2 3 4 5
3.	Plan a property insurance program.	1 2 3 4 5
4.	Plan a crop insurance program.	1 2 3 4 5
5.	Plan an individual health and disability insurance program.	1 2 3 4 5
6.	Match terms commonly associated with insurance to their correct definition.	6 7
7.	Interpret essential information contained in an insurance policy.	6 7
8.	Discuss orally the advantages and disadvantages of life insurance.	6 7
9.	Identify ways to reduce insurance premiums.	6 7
10.	Compare two insurance policies and select the one that is the best buy.	6 7

These competencies are outlined in the National Ag Occupations Competency Study, 1978, for entry level positions in agriculture.

Name Date

INFORMATION SHEET

COMMON INSURANCE TERMS

1. ANNUITY -- A contract that provides an income for a specified period of time such as a number of years or for life.

2. APPLICATION -- A statement of information made by a person applying for insurance (NOTE: This becomes part of the policy.)

3. AUTOMATIC PREMIUM LOAN -- A provision authorizing the premium to be subtracted from policy cash values if not paid by the end of the grace period.

4. BENEFICIARY -- Person named in the policy to receive proceeds at death of insured.

5. CASH VALUE -- Amount available in cash upon voluntary termination of policy before death.

6. CONVERTIBLE -- Term insurance exchanged at option of policyholder without evidence of insurability for another insurance plan.

7. CREDIT INSURANCE -- Written through lending institutions on lives of borrowers (NOTE: Most credit insurance is decreasing term policies in which the amount of insurance is equal to the unpaid portion of the mortgage.)

8. DISABILITY BENEFIT (Waiver of premium) -- The provision added to life insurance to pay premiums if totally and permanently disabled.

9. DOUBLE INDEMNITY -- An accidental death benefit to pay double face amount in case of death prior to maturity.

10. ENDOWMENT INSURANCE -- Insurance payable to the insured if living on maturity date or death prior to maturity.

11. FACE AMOUNT -- Amount stated on the face of the policy that will be paid in case of death or at maturity.

12. FAMILY INCOME LIFE INSURANCE -- A combination of permanent life insurance and decreasing term insurance.

13. GRACE PERIOD -- A period (usually 31 days) following the premium due date during which a premium may be paid without a penalty (NOTE: This applies only to life insurance where stated and sometimes health insurance.)

14. GROUP INSURANCE -- Insurance which is usually issued without a medical examination on a group of persons under a single master contract.

15. HOMEOWNER'S POLICY -- A combination of several coverages or protections in one policy regarding home, personal property, and liability insurance.

16. INSURANCE -- Spreads the risk of one person's misfortune among a large number of persons.

17. LAPSED POLICY -- A policy terminated for nonpayment of premium.

18. LIABILITY -- When one is negligent and therefore liable for injury or damage caused to someone else (NOTE: Liability insurance protects one from claims made by other people and provides defense in the event of a groundless suit. Liability limits should be equal to assets.)

19. PERMANENT LIFE INSURANCE -- Includes straight life, limited pay, and endowment.

20. POLICY DIVIDEND -- A refund of part of the premium on participating policies plus interest.

21. POLICY -- Document stating terms of contract that is issued to policyholder by the company.

22. POLICY LOAN -- Cash loaned on the cash value of policy at a specified interest rate.

23. PREMIUM -- The payment or consideration one makes as a policyholder in agreement with the policy for insurance.

24. TERM LIFE INSURANCE -- Give protection for a stated period of time and at the end of term is the termination of contract.

INFORMATION SHEET

AUTO INSURANCE TERMS*

1. ASSIGNED RISK - A driver or auto owner not acceptable for insurance in the open market. This person may obtain coverage through a state-assigned pool which requires each auto insurance company in the state to accept a proportionate share of poor risk applicants. Premiums are usually higher than auto insurance sold in the open market and coverage is restricted.

2. COLLISION INSURANCE - Auto insurance which covers the policyholder's car up to established limits, for property damage resulting from the collision of that auto with another vehicle or object. This type of insurance does not cover bodily injury or liability arising from the collision.

3. COMPREHENSION INSURANCE - All risk coverage for the policyholder's auto with some specific exceptions.

4. DECLARATIONS PAGE - The portion of the insurance policy, usually the first page, which lists such information as name and address of the policyholder, description of the property insured, amount and types of coverage, and the premium.

5. DEDUCTIBLE - An established dollar amount, say $100, beyond which insurance protection begins. In the event of a claim, the policyholder in this case pays the first $100 of repair costs and the insurance company pays, according to policy specifications, repair costs over the deductible.

6. INSURED - The person(s) covered in an insurance policy.

7. LIABILITY INSURANCE - Insurance which covers money the policyholder may be required to pay as a result of legally determined negligence. Liability insurance may cover bodily injury to another, damage to anothers' property, or both.

8. MEDICAL PAYMENTS - Included in most auto policies, this coverage provides for payment - without regard to liability - of medical, surgical, and ambulance costs for the policyholder and passengers when they are injured in the policyholder's car. In case of death from such injury, funeral expenses are also covered.

9. UNINSURED MOTORIST COVERAGE - A provision under which the policyholder's auto insurance company may pay for damage caused by an uninsured motorist who is determined liable for the damage.

*Terms and definitions were prepared by Country Companies Insurance group.

INFORMATION SHEET

COMPARING TYPES OF LIFE INSURANCE

In all types of life insurance except term insurance, the premiums paid in the early part of the insurance period exceed the cost of the risk, which is lowest in this period. The excess payments build up a reserve fund which belongs to the insured person and against which the insured can borrow or can receive cash by surrending the policy.

The characteristics of the more common types of life insurance are listed below. It is assumed that the premiums are paid as called for in the policy.

TYPE	RELATIVE SIZE OF ANNUAL PREMIUM	DURATION OF INSURANCE	WHEN PREMIUM PAYMENTS WILL CEASE	AMOUNT RECEIVED BY BENEFICIARY	WILL A LOAN OR CASH SURRENDER VALUE BE ACCUMULATED?
Term	Smallest	During stated term	At end of stated term	Face value of policy while policy is in force	No
Ordinary life	Small	For rest of life of insured	Death of insured	Value of policy	Yes
Limited-pay life	Medium to large, depending on number of years it is paid	For rest of life of insured	Period stated in policy (10, 20, 30, years or until age 65, etc.)	Face value of policy	Yes
Endowment	Large	During term of policy. When fully paid, insured may receive face value in cash.	At end of term of policy	Face value of policy during term of policy	Yes

Combinations of these types are possible.

Which type of policy is preferable will depend on the circumstances of the insured and family situation.

In all types of life insurance except term, there is an element of saving. There is some feeling of compulsion about keeping the premiums paid on a life insurance policy, and hence an element of "forced" saving. The savings will be paid back in dollars which, due to inflation, will buy fewer goods and services. Life insurance is needed more by the young couple with children to support and educate and with probably no opportunity to accumulate wealth, than by older couples whose children are self-supporting. If a young family's income is low, emphasis may be placed on term or ordinary-life policies, which give maximum protection at minimum cost. For most people the following summary will apply:

TYPE	MAJOR ADVANTAGE	MAJOR DISADVANTAGES
Term	Low cost. Protects beneficiary during term of policy	Limited period of protection. Builds up no cash reserve.
Ordinary Life	Relatively low annual premium. Provides full protection for beneficiary. Builds up reserve fund slowly.	Insured pays premiums throughout life.
Limited-pay Life	Provides full protection for beneficiary. Duration of premium payments is limited. Builds up reserve fund.	Premiums higher than for ordinary life policies.
Endowment	Provides protection for beneficiary during term policy. Rapidly builds up a relatively large reserve fund.	Highest premiums.

STUDENT WORKSHEET #1

UNDERSTANDING LIFE INSURANCE COVERAGE

(Refer to VAS Unit 6017)

1. People purchase ____________ as a means of protection against risk.

2. What is a definition of risk?

3. What is insurance?

4. Insurable hazards are those that are ___________ or ___________ and you cannot predict when the happening will occur.

5. What are some important uses of life insurance?

6. Tables which have been prepared by life insurance companies to show how many people of certain ages will die each year are called tables of ______________________.

7. Complete the following for your nearest age group:

   a. Number living = __________________.
   b. Deaths/year = __________________.
   c. Deaths/1000 = __________________.
   d. Expectation of life = __________________.

8. The major source of income for life insurance companies is the customers _________ ________.

9. Life insurance provides protection against what possibilities?

10. The major types of life insurance policies are ____________, ____________ ________, ____________, ______________ ______________, and ____________ ________.

11. Insurance used to provide assurance that a debt will be repaid is ________________.

12. The kind of insurance policy sold to more people than any other is ________________.

13. The policy which has premiums payable for a specified number of years is ______________________.

14. The type of policy with the highest premium payments is ____________ ______.

15. What general factors should be considered when deciding on the kinds and amounts of life insurance?

STUDENT WORKSHEET #2

UNDERSTANDING LIABILITY, PROPERTY, AND HEALTH INSURANCE COVERAGE

(Refer to VAS Unit 6017)

1. The obligations liability insurance covers are _____ and not ____ ones.
2. An auto liability policy with 100/300/50 coverage would pay what expenses?
3. A business generally covers liability as far as employees are concerned with ___________ ______________ ___________.
4. Automobile insurance can be issued to cover _____________, ___________ ______, ______________, ________________, ______________ ___________, and ____________ ______________.
5. Comprehensive insurance covers most kinds of losses other than _______.
6. Protection against financial loss due to fire and lightning is available through __________ _____ ___________, with __________ __________ you are also protected from such perils as windstorm, hail, explosion, etc.
7. The two major kinds of crop insurance are _____ and ________ crop insurance.
8. Has crop coverage been increasing or decreasing in recent years? Why?
9. When you buy health insurance, what type should you look for?

10. Protection against _____ losses is still the most important financial objective to meet through ________.

11. The two kinds of companies that provide insurance are _____ and _____ companies.

12. Name eight basic guides to a sound insurance program.

a.

b.

c.

d.

e.

f.

g.

h.

307

STUDENT WORKSHEET #3

FARM BUSINESS INSURANCE

(Refer to VAS Slidefilm 380A)

1. Fire strikes the property of __ out of every _____ people each year.

2. Insurance does not prevent the ______ loss, only the ________ loss.

3. In the United States an accidental injury occurs every three _______ and a _____ accident every _____ minutes.

4. Approximately __________ farm residents have disabling injures per year.

5. Farming ranks as the _____ most dangerous industry in the United States.

6. Name the four principles of insurance.

7. An insurance _____ is a document that contains a ________ between the _______ and the ________ __________.

8. Name the three parts of an insuring agreement.

9. A crop hail policy provides protection for crop loss caused by:

10. How can medical and hospital insurance be an important part of the farm business?

STUDENT JOB SHEET

EVALUATING PERSONAL INSURANCE COVERAGE

Objective: To help students evaluate their personal insurance protection.

Materials:
- Automobile insurance policies
- Property insurance policies
- Life insurance policies
- Health insurance policies

Procedure: With the assistance of your parents and vocational agriculture instructor, complete the following information.

I. Automobile Insurance

TYPE OF AUTOMOBILE	AMOUNT OF LIABILITY COVERAGE	AMOUNT OF COLLISION	AMOUNT OF COMPREHENSION	AMOUNT OF MEDICAL
A.				
B.				
C.				
D.				

	Yes	No
1. Is the liability coverage the same on all auto's?	___	___
2. Are the liability limits adequate?	___	___
3. Does each auto have medical coverage?	___	___
4. Should comprehensive and collison be adjusted for value of auto's?	___	___

II. Property Insurance

	TYPE OF PROPERTY	LIMIT OF COVERAGE	MEDICAL COVERAGE	STANDARD FIRE	EXTENDED COVERAGE
A.					
B.					
C.					
D.					
E.					
F.					

		Yes	No
1.	Is all the property adequately insured?	___	___
2.	Is the liability coverage adequate?	___	___
3.	Is the crop insurance adequate?	___	___
4.	Would the insurance replace the personal property with a new item or use a depreciated value for payment due?	___	___

III. Life Insurance

	FAMILY MEMBER	AMOUNT OF COVERAGE	KIND OF POLICY
A.			
B.			
C.			
D.			
E.			
F.			

	Yes	No
1. If the primary wage earner died, would the savings, and insurance cover all debts?	___	___
2. After debts are paid, would there be enough left to provide survivors with adequate income?	___	___
3. After debts are paid, would there be enough left to pay due taxes?	___	___

IV. Health Insurance

1. Type of policy: ______________________________

2. Hospital-surgical coverage limits: $______________________________

3. Major medical coverage limits: $______________________________

4. Medicine and drugs covered: $______________________________

5. Outpatient care limits: $______________________________

6. Other significant coverage:

____

____

____

IV. Summary

Using the information collected in this assignment, what changes would you recommend for:

A. Automobile Insurance:

B. Property Insurance:

C. Life Insurance:

D. Health Insurance:

TEACHER'S KEY

STUDENT WORKSHEET #1

UNDERSTANDING LIFE INSURANCE COVERAGE

(Refer to VAS Unit 6017)

1. People purchase insurance as a means of protection agains risk.

2. What is a definition of risk?

   The occurrence of hazards that can be predicted among a large group with a reasonable amount of accuracy.

3. What is insurance?

   A means of transferring risk to someone else.

4. Insurable hazards are those that are accidental or fortuitous and you cannot predict when the happening will occur.

5. What are some important uses of life insurance?

   a. Protect family against financial loss of provider.
   b. Source of savings.
   c. Retirement income.
   d. Use of credit.
   e. Transfer of wealth to next generation.

6. Tables which have been prepared by life insurance companies to show how many people of certain ages will die each year are called tables of mortality.

7. Complete the following for your nearest age group:

   a. Number living = ____________________.
   b. Deaths/year = ____________________.
   c. Deaths/1000 = ____________________.
   d. Expectation of life = ____________________.

8. The major source of income for life insurance companies is the customers premium payment.

9. Life insurance provides protection against what possibilities?

   a. That you will die prematurely and leave dependents without much income.

   b. That you live so long that you use up all of your income and become a burden on society.

10. The major types of life insurance policies are term, straight life, limited payment, and endowment.

11. Insurance used to provide assurance that a debt will be repaid is term life.

12. The kind of insurance policy sold to more people than any other is straight life.

13. The policy which has premiums payable for a specified number of years is limited pay life.

14. The type of policy with the highest premium payments is endowment.

15. What general factors should be considered when deciding on the kinds and amounts of life insurance?

    a. Debts to be paid off.
    b. Funds for education.
    c. Income for family.

TEACHER'S KEY

STUDENT WORKSHEET #2

UNDERSTANDING LIABILITY, PROPERTY, AND HEALTH INSURANCE COVERAGE

(Refer to VAS Unit 6017)

1. The obligations liability insurance covers are legal and not moral ones.
2. An auto liability policy with 100/300/50 coverage would pay what expenses?
   a. $100,000 in bodily injury damages to each individual injured in a given occurrence.
   b. $300,000 in total bodily injury damages.
   c. $50,000 in total property damages in a given occurrence.
3. A business generally covers liability as far as employees are concerned with workmen's compensation insurance.
4. Automobile insurance can be issued to cover liability, collision, comprehensive coverage, medical care, and road service.
5. Comprehensive insurance covers most kinds of losses other than collision.
6. Protection against financial loss due to fire and lightning is available through standard fire insurance, with extended coverage you are also protected from such perils as windstorm, hail, explosion, etc.
7. The two major kinds of crop insurance are hail and all-risk crop insurance.
8. Has crop coverage been increasing or decreasing in recent years? Why?

   Increasing. Because of increasing costs of production and higher crop values per acre.
9. When you buy health insurance, what type should you look for?

   A non-cancellable, guaranteed renewable type

10. Protection against large losses is still the most important financial objective to meet through insurance.

11. The two kinds of companies that provide insurance are stock and mutual companies.

12. Name eight basic guides to a sound insurance program.

    a. Emphasize protection as the main purpose.

    b. Determine income from social security and retirement plans.

    c. Provide for broad coverage of serious risks and self insure against small risks.

    d. Use reliable agents.

    e. Use group plans.

    f. Consider possible special hazards.

    g. Consider cost in relation to risk.

    h. Compare insurance coverage from various companies.

TEACHER'S KEY

STUDENT WORKSHEET #3

FARM BUSINESS INSURANCE

(Refer to VAS Slidefilm 380A)

1. Fire strikes the property of 13 out of every 1000 people each year.
2. Insurance does not prevent the physical loss, only the financial loss.
3. In the United States an accidental injury occurs every three seconds and a fatal accident every five minutes.
4. Approximately 560,000 farm residents have disabling injures per year.
5. Farming ranks as the third most dangerous industry in the United States.
6. Name the four principles of insurance.
    a. Theory of probability and law of averages.
    b. Insurable interest.
    c. Indemnity
    d. Mutuality of interests.
7. An insurance policy is a document that contains a contract between the insured and the insurance company.
8. Name the three parts of an insuring agreement.
    a. Items insured.
    b. Hazards insured against.
    c. Amount of insurance.
9. A crop hail policy provides protection for crop loss caused by:
    a. Hail storms.
    b. Fire.
    c. Lightning.
10. How can medical and hospital insurance be an important part of the farm business?
    a. Money used to pay medical bills will reduce profit and operating capital.

    b. By paying a premium, the risk of a large payment is avoided for the year.

FACTORS INFLUENCING AMOUNT OF LIFE INSURANCE NEEDED

Family income

Net worth of family

Age of children

Number of family dependents

Skills and abilities of parents

Indebtedness of family

Long-range goals of family members

Occupations of family members

Health of family members

ENDOWMENT LIFE INSURANCE

Policy puts emphasis on savings more than any other life insurance

Purpose is to accumulate a certain amount of money in a specified period, while providing life insurance

If policy holder lives, whole amount of policy is paid to holder when endowment comes due

If policy holder dies before the period has elapsed, the full amount of the policy is paid to the beneficiary

Expensive form of insurance protection

Suits those who wish money for educating children or during retirement

LIMITED PAYMENT LIFE INSURANCE

Provides lifetime protection

Premiums are paid only during a specified period of time

Fewer premiums are necessary because each payment is larger

Accumulate cash value

Twenty year, thirty year pay, or paid up to life at 65 are examples of limited payment life insurance

TERM LIFE INSURANCE

Covers stated number of years or term that the policy is in effect

Usually does not accumulate any cash value

For the time it is contracted, it is the cheapest form of life protection

Used for business insurance protection, creditor's risk, and general family protection

Chances of death increase with age, therefore policy rates are higher for each succeeding period

No guarantee of renewal

Group insurance is usually term insurance

Insurance protection ends when the stated term expires

ORDINARY LIFE INSURANCE

ALSO KNOWN AS STRAIGHT LIFE OR WHOLE LIFE

Provides lifetime protection

Most widely used of all permanent life insurance

Costs less annually than any other kind of life time protection

Premiums are paid through the policy holder's lifetime

Policy accumulates a cash value

Policy holder may borrow the cash value of the policy

FACTORS INFLUENCING PROPERTY INSURANCE PREMIUMS

Type of coverage (homeowners, farmowners)

Amounts of deductible and protection limits

Type of dwelling construction

Number of basic coverages of policy

Geographical location

Distance from fire department

Fire district service area

Period of time covered

FACTORS INFLUENCING AUTOMOBILE INSURANCE PREMIUMS

Number of basic coverages of policy

Area one lives in

Value and size of automobile

Age of principal drivers

Sex of principal drivers

Marital status of principal drivers

Distance one drives to work

Use of car— business or pleasure

Driving habits of individuals

Number of claims paid against policy

Cost of repairs for type of auto

Amounts of deductible and protection limits

Multi– or single–car coverage

BASIC AUTOMOBILE INSURANCE

Bodily injury liability

Property damage liability

Medical reimbursement

Comprehensive physical damage

Collision

Protection against uninsured motorist

TYPES OF LIABILITY INSURANCE

Public liability

Employer liability

Workman's compensation

Farmer compensation liability

TEACHER'S KEY

SAMPLE TEST QUESTIONS

PLANNING AN INSURANCE PROGRAM

PART I. True (+) - False (0)

__+__ 1. Any person buying property insurance must have an insurable interest in that property.

__+__ 2. An insurable interest includes a full or partial ownership and the rights of ownership in a property.

__+__ 3. Standard fire insurance covers property for loss or damage due to fire or lightning.

__0__ 4. It is not necessary to describe every insurable building on your land when taking out a liability policy.

__0__ 5. One should insure for the small losses and budget for the big losses.

__0__ 6. The major source of income to life insurance companies is through the stock market.

__0__ 7. Savings is the major purpose of insurance rather than protection.

__+__ 8. One should check various owned policies for duplicate coverage for the same kind of losses.

__+__ 9. A common type of insurance policy to cover personal property even while you are traveling is the personal property floater.

__0__ 10. The mutual insurance company will return its profits to the stockholders and not the policy holders.

PART II. Multiple Choice

__B__ 1. A person named in the policy to receive proceeds at death of the insured is the:

A. Application
B. Beneficiary
C. Liability
D. Premium

C 2. Spreading the risk of one person's misfortune among a large number of persons is called:

A. Convertible
B. Credit
C. Insurance
D. Liability

D 3. The payment one makes as a policyholder for insurance is called:

A. Annuity
B. Face amount
C. Lapsed policy
D. Premium

A 4. Insurance that pays for damages to your car in an accident is called:

A. Collision
B. Comprehensive
C. Medical
D. Road service

A 5. Insurance that provides financial protection against most causes of crop damage is:

A. All-risk crop insurance
B. Farm insurance
C. Hail crop insurance
D. Liability insurance

C 6. Insurance for your whole life with premiums payable until death is:

A. Endowment
B. Limited payment
C. Straight life
D. Term

B 7. The amount of a policy that will be paid in case of death or at maturity is:

A. Annuity amount
B. Face amount
C. Policy loan amount
D. Premium amount

D 8. A refund of part of the premium on participating policies plus interest is:

A. Cash value
B. Double indemnity
C. Grace period
D. Policy dividend

A 9. Life insurance with the highest premium payments is:

A. Endowment
B. Limited payment
C. Straight life
D. Term

A 10. Insurance which covers major medical expenses is medical:

A. Catastrophe coverage
B. Deductible coverage
C. Disability coverage
D. Group coverage

PART III. Matching

Column A

E 1. Disability benefit
B 2. Double indemnity
F 3. Term life insurance
I 4. Homeowner's policy
A 5. Liability
H 6. Medical coverage
D 7. Permanent life
C 8. Policy dividend
J 9. Public liability
G 10. Workman's compensation

Column B

A. One is negligent in causing injury to another.
B. Death benefit paying twice face amount in accidental death.
C. Refund of part of premium.
D. Includes straight life, limited pay, and endowment.
E. Provision to pay premiums if disabled.
F. Life insurance for only stated period of time.
G. Pays employee's medical expense regardless of who is negligent.
H. Pays for hospital expenses incurred as a result of accident or illness.
I. Combination of several coverages on home, personal property, and liability.
J. Protects person from lawsuits by public who are injured because of person's negligence.

PART IV. Completion

1. The term risk refers to the occurrence of hazards that can be predicted among a large group.
2. A deductible clause exempts an insurance company from certain claims.
3. Insurance companies use mortality tables to predict how many people of a certain age will die per year.
4. Insurance should be purchased from a reliable agent.
5. Corporations that are owned by policyholders are called mutual companies.
6. Coverage in a farm owners' policy will cover machinery, livestock, flood damage, etc.
7. Insurance which provides for towing and a limited amount of first aid to the car is emergency road service coverage.
8. An insurance company will defend you for legal obligations and not moral obligations.
9. In a 50/150/100 liability insurance policy the 100 is the coverage for property damages.
10. Insurance which is issued to individuals working under a master contract and where no medical examination is required is termed group insurance coverage.

PART V. Essay

1. What factors should be considered when planning the kinds and amounts of life insurance to purchase?

   (See VAS Unit 6017, Part 1)

2. Name and briefly discuss four important areas of coverage available for automobile insurance.

   (See VAS Unit 6017, Part 3)

UNIT I: AGRICULTURAL BUSINESS MANAGEMENT

PROBLEM AREA: USING THE ILLINOIS FARM RECORD BOOK

SUGGESTIONS TO THE TEACHER:

This problem area is designed for advanced students in vocational agriculture programs. The recommended time for teaching this problem area is January or February during traditional accounting periods. The estimated instructional time for this problem area is 8 to 10 days. This problem area is written with the following assumptions:

1. The students are familiar with S.O.E.P. record keeping.
2. The financial records are applicable to all businesses and are not exclusive to farming.
3. The students should develop a sense of good management through record keeping.

CREDIT SOURCES:

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The teacher's guide, and student worksheets were prepared by Michael H. Rauch, Department of Vocational and Technical Education, University of Illinois. Transparency masters and sample test questions were prepared by Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture teachers:

Michael Robertson - Chrisman High School
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TEACHER'S GUIDE

I. Unit: Agricultural business management

II. Problem area: Using the Illinois Farm Record Book

III. Objectives: At the close of this problem area students will be able to:

1. Place income and expense entries in the Illinois Farm Record Book.
2. Locate and explain specific entries in the Illinois Farm Record Book.
3. Identify the major financial statements.
4. Determine the net income of an operation given the necessary information in the record book.
5. Understand the significance of various figures used for financial analysis (net income, returns to management, rate of return on investment).
6. Complete the practice farm record problem.

IV. Suggested interest approaches:

1. Discuss the importance of record keeping as it relates to sound management practices, income taxes, and obtaining loans.
2. Have students discuss their experiences with S.O.E.P. record keeping and relate them to the farm business.
3. Discuss interest rates on bank accounts and compare that to the rate of return on investments in the farm business.
4. Invite a resource person (farm lender, FBFM fieldman, farm manager) to address the class on the importance of farm business records.

V. Anticipated problems and concerns:

1. What is the Illinois Farm Record Book?
2. Where can I get an Illinois Farm Record Book, and how much does it cost?
3. When do I use the Illinois Farm Record Book?
4. What information can I get out of the book?
5. Why do we need records?
6. Why use the Illinois Farm Record Book?

7. What information should be entered in the record book?

8. How will this problem area help me if I do not farm?

9. How do I summarize records?

10. How can record keeping help with future planning?

11. How do I analyze records?

VI. Suggested learning activities and experiences:

1. Conduct an interest approach and aid students in identifying their problems and concerns.

2. Present VAS Unit 2008b,"Record Keeping on the Farm" to answer general record keeping questions and provide a base to enter into class work on the Illinois Farm Record Book.

3. Show the class an Illinois Farm Record Book and distribute the Practice Book.

4. Present VAS Unit 2009b and explain how the Illinois Farm Record Book is organized.

5. Hand out the Farm Record Problem and enter beginning inventories in the practice book.

6. Discuss depreciation (from Core IV, Understanding Agricultural Taxes) and complete part 2 of the farm problem.

7. Have the students complete the farm problem and discuss the summary pages. (Pairing students may speed up this exercise.)

8. Check the accuracy of the students summaries and explain the usefulness of them in planning their own S.O.E. programs.

9. Analyze the Illinois Farm Record Books to determine returns to operator's labor, capital, and management, rate earned on investment, costs and returns analysis, efficiencies. Compare these to the Summary of Illinois Farm Business Records.

10. Use VAS Unit 2037a to aid in analyzing records and to determine their significance.

11. Visit a professional farm manager or a nearby bank's farm department to have them explain how and why they use selected record keeping procedures and what they look for in a good set of farm records.

12. Distribute Worksheet #1 and review record keeping concepts with the students.

13. Discuss a regular entry program (weekly, monthly) and the importance of using checks for all farm purchases which are tax deductible.

VII. Application procedures:

1. Students should be able to make entries in record books and keep them up to date for business and farm income evaluation.
2. Establish an awareness of good record keeping practices and their value to successful management.
3. Show the way in which many farmers actually keep their own records in the Illinois Farm Record Book.

VIII. Evaluation:

1. Administer and evaluate worksheets included in this problem area.
2. Evaluate the Illinois Farm Record Practice Book of each student.
3. Prepare a paper and pencil test on the Illinois Farm Record Book.

IX. References and aids:

Available from Vocational Agriculture Service, University of Illinois:

1. VAS Unit 2008b, Record Keeping on the Farm.
2. Illinois Farm Record Book, Practice Book.
3. Illinois Farm Record Book, Teacher's Key.
4. VAS Unit 2009b, Using the Illinois Farm Record Book.
5. A Farm Record Problem.
6. VAS Unit 2037a, Setting Up Farm Records To Provide For Analysis.
7. Summary of Illinois Farm Business Records. Cooperative-Extension Service Circular 1193.

COMPETENCY INVENTORY

USING THE ILLINOIS FARM RECORD BOOK

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.

Competency	Circle One				
1. Keep production, performance, and breeding records.	1	2	3	4	5
2. Keep livestock and crop equipment inventories.	1	2	3	4	5
3. Set up a record keeping system for a farm business.	1	2	3	4	5
4. Keep financial records for a crop and livestock farm.	1	2	3	4	5
5. Determine efficiency of production.	1	2	3	4	5
6. Keep personnel records.	1	2	3	4	5
7. Prepare a budget for a farm business.	1	2	3	4	5
8. Determine rate of gain of livestock.	1	2	3	4	5
9. Determine marketing costs for crop and livestock.	1	2	3	4	5
10. Figure per unit costs and return.	1	2	3	4	5
11. Figure depreciation on capital items.	1	2	3	4	5
12. Determine the net worth of the agricultural business.	1	2	3	4	5

These competencies are outlined in the National Ag Occupations Competency Study, 1978, for entry level positions in agriculture.

Name ______________________ Date ______________

STUDENT WORKSHEET #1

DEVELOPING RECORDKEEPING SKILLS

(Refer to VAS Unit 2008b, Record Keeping on the Farm)

1. How can a good set of record books help a farm business?

   Good records can:

   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

   e. ____________________

   f. ____________________

   g. ____________________

   h. ____________________

2. When should farm records be started?

3. Farm records generally include what three major kinds of accounts?

   a. ____________________

   b. ____________________

   c. ____________________

4. An ____________ is a list of items and their values on hand at a particular time.

5. What items should be included in a complete inventory account?

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

6. If an item is depreciable, it belongs in a __________ account.

7. What is depreciation?

8. Cash accounts include all items of cash farm income and expenses not included in __________ and __________ accounts.

9. List the major steps involved in keeping adequate records.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

10. Why should individuals take time to complete an analysis of their business records?

a. ______________________________

b. ______________________________

c. ______________________________

____

STUDENT WORKSHEET #2

USING THE ILLINOIS FARM RECORD BOOK

(Refer to VAS Unit 2009b, Using the Illinois Farm Record Book)

1. What are four types of entries found in Part I of the Illinois Farm Record Book?

    1. ____

    2. ____

    3. ____

    4. ____

2. How often is it necessary to use Part II of the record book?

3. In completing and summarizing a farm record, everything possible should be done to check it for ______________ and __________.

4. How do you check livestock numbers or feed and grain quantities?

5. What are the major summaries found in the Record Book?

    1. ____

    2. ____

    3. ____

    4. ____

    5. ____

6. A farmer reporting income tax on the cash basis would need Form ______ and Schedule ___ for reporting sales of __________ items and Schedule ___ for his ordinary farm income.

7. Rate earned on investment is often calculated by dividing the __________ ________________________ by the total __________ at the beginning of the year.

TEACHER'S KEY

STUDENT WORKSHEET #1

DEVELOPING RECORDKEEPING SKILLS

(Refer to VAS Unit 2008b, Record Keeping on the Farm)

1. How can a good set of record books help a farm business?

   Good records can:

   a. provide information for analysis.

   b. make it possible to compare the business with students.

   c. help with reporting of income and social security tax.

   d. help with getting a loan.

   e. provide evidence for payment of a bill.

   f. provide information for government farm programs.

   g. help divide income and expense between tenant and landlord.

   h. assist in settling estates.

2. When should farm records be started?

   As soon as you begin work on the enterprise, you need a complete record of income and expenses associated with the enterprise.

3. Farm records generally include what three major kinds of accounts?

   a. Inventory accounts.

   b. Capital accounts.

   c. Cash accounts.

4. An inventory is a list of items and their values on hand at a particular time.

5. What items should be included in a complete inventory account?

   a. The quantities and values of items.

   b. The quantities on hand at beginning of the year.

   c. The quantities purchased during the year.

   d. The quantities sold during the year.

   e. The quantities on hand at end of the year.

6. If an item is depreciable, it belongs in a capital account.

7. What is depreciation?

   It is a bookkeeping method of distributing the cost of capital items over more than one year of useful life.

8. Cash accounts include all items of cash farm income and expenses not included in inventory and capital accounts.

9. List the major steps involved in keeping adequate records.

   a. Enter the beginning-of-the-year inventories.

   b. Set up the depreciation schedules.

   c. Enter records of receipts, expenses, and production.

   d. Enter end-of-the-year inventories.

   e. Complete yearly depreciation schedules.

10. Why should individuals take time to complete an analysis of their business records?

   a. It can be used as a means for improvement.

   b. It indicates strong and weak points of the business.

   c. It can be used to determine the best combinations of enterprises for most profit.

TEACHER'S KEY

STUDENT WORKSHEET #2

USING THE ILLINOIS FARM RECORD BOOK

(Refer to VAS Unit 2009b, Using the Illinois Farm Record Book)

1. What are four types of entries found in Part I of the Illinois Farm Record Book?

   1. Farm receipts
   2. Farm expenditures
   3. Production records
   4. Inventories

2. How often is it necessary to use Part II of the record book?

   Generally only twice, at the beginning and end of the year, and when depreciable items are bought or sold.

3. In completing and summarizing a farm record, everything possible should be done to check it for completeness and accuracy.

4. How do you check livestock numbers or feed and grain quantities?

   Add the number accounted for, which is end-of-year inventory, sales, home consumption, and losses; and compare that to the number to account for, which is beginning-of-year inventory, purchases, and production.

5. What are the major summaries found in the Record Book?

   1. Cash farm receipts
   2. Cash farm expenditures
   3. Farm income
   4. Depreciable assets
   5. Inventory of feed, grain, livestock, and supplies.

6. A farmer reporting income tax on the cash basis would need Form 4797 and Schedule D for reporting sales of capital items and Schedule F for his ordinary farm income.

7. Rate earned on investment is often calculated by dividing the returns for capital and management by the total investment at the beginning of the year.

WHY GOOD RECORDS ARE IMPORTANT

- To provide a means of comparing your results with standards of efficiency and profit
- To accurately report taxes
- To help obtain credit and loans
- To provide evidence of payments and receipts
- To supply information for government programs
- To provide a means of dividing income and expenses among individuals
- To aid in settling estates

GOOD RECORD-KEEPING HABITS

- ☆ Make entries regularly
- ☆ Write records in notebook or calendar if not entered in recordbook immediately
- ☆ Keep records up-to-date
- ☆ Enter complete information
- ☆ Keep recordbook neat and legible

FARM RECORD ACCOUNTS

INVENTORY-	Items held for sale or use in production and are capable of being held or stored on the farm. (livestock, feed, and grain)
CAPITAL-	Items which can be depreciated. (machinery, equipment, auto, soil improvements, and farm improvements)
CASH-	Items of cash farm income and expenses. (egg sales, dairy product sales, custom work, government payments, refunds, breeding fees)
OTHER-	■ land inventory ■ farm map ■ production records ■ losses ■ unpaid labor

STEPS IN RECORD-KEEPING

A. Enter beginning-of-year inventories

B. Set up depreciation schedules

C. Enter receipts, expenses, and production records

D. Enter end-of-year inventories

E. Complete depreciation schedules

RECORDS FOR TAX PURPOSES

Farm Record Book	Income Tax
Farm Receipts (cash)	Schedule F Part 1
Capital Sales	Form 4797 and Schedule D
Depreciable Assets	Form 4562
Farm Expenses (cash)	Schedule F Part 2
Farm Receipts (accrual)	Schedule F Part 3
Farm Expenses (accrual)	Schedule F Part 4

MAJOR RECORD BOOK SUMMARIES

Farm Income Summary

Summary of Depreciable Assets

Inventory Summary of Feed, Grain, Livestock, and Supplies

Summary of Cash Farm Receipts

Summary of Cash Farm Expenditures

Summary of Assets

ANALYZING RECORDS

☆ Power and machinery cost efficiency

☆ Livestock production efficiency

☆ Feeding efficiency

☆ Crop yields

☆ Marketing results for livestock and crops

☆ Labor costs

Teacher's Key
Test Questions
Using the Illinois Farm Record Book

(Student must have Illinois Farm Record Book to take exam)

TRUE (+) - FALSE (0)

+ 1. There is a difference in reporting income an expenses for the cash and accrual methods of reporting income tax returns.

0 2. The most common method of determining the value of an inventory item such as corn is to base it on its market value per bushel minus the cost of production per bushel.

+ 3. Growing and standing crops are usually not included in inventories unless such crops were purchased.

0 4. For the accrual method of reporting income tax returns enter in the account book only those farm expenses which were paid during the year.

+ 5. The most common method of determing the values of inventory items such as hogs and cattle being fed is to base them on their market prices less the estimated direct costs of disposition.

+ 6. For the cash method of reporting income tax returns enter in the Illinois Farm Record Book all sales of farm products for which payment was received during the tax period.

0 7. For the cash method of reporting income tax returns enter in the Illinois Farm Record Book all farm expenses incurred whether or not payment was made during the tax year.

0 8. In keeping records of a farm business it is best to set aside time to make entries at least quarterly during the year.

+ 9. For the accrual method of reporting income tax returns enter in the Illinois Farm Record Book all sales made during the tax period even though payment is not received until a later date.

+ 10. Complete the 'depreciation for this year" column at the end of the year.

MULTIPLE CHOICE (Make appropriate choice of A, B, C, or D)

D 1. Record book summaries can be useful for:

A. Studying the farm business
B. Planning the flow of cash
C. Making out tax reports
D. All of the above

C 2. One of the major methods of figuring depreciation is:

A. Estimated portion
B. Straight balance
C. Sum of the years' digits
D. Combine A and C to determine

D 3. To be used for determining units of production in dairying:

A. 1000 lbs of milk
B. 100 lbs of butter fat
C. 1 hundred weight of meat
D. Combine A and C to determine

B 4. Money that becomes available to a farm business through borrowing:

A. Should be entered as an inventory of cash available in the Illinois Farm Record Book
B. Enter in the Farm Receipts section of the Illinois Farm Record Book
C. Should never be entered in the Illinois Farm Record Book
D. Enter in the expense Section of the Illinois Farm Record Book

A 5. The Illinois Farm Record Book provides for a continuous depreciation schedule for the following number of years:

A. 5 years
B. 10 years
C. 7 years
D. 3 years

C 6. Facts:
Acquired a tractor in 1976 for $17,200
Estimated useful life - 8 years
Salvage value - $1,200
Under the straight line method the depreciation for 1978 would be:

A. $2,550
B. $1,950
C. $2,150
D. $1,750

D 7. Facts:
Acquired an elevator in 1972 for $1,320
Twelve years estimated useful life
Salvage value - $50
Under the straight line method of depreciation for 1978 would be:

A. $90
B. $100
C. $105
D. $110

D 8. In the Illinois Farm Record Book hired labor is entered on:

A. Page 14
B. Page 15
C. Pages 14 and 15
D. Pages 14, 15 and 44

D 9. In the Illinois Farm Record Book inventories of corn are entered on:

A. Page 46
B. Page 3
C. Pages 46 and 51
D. Page 51

C 10. When making an income tax return on the cash basis a farmer needs the following form or forms to report his ordinary farm income:

A. Form 7797
B. Schedule A (Form 1640)
C. Schedule F (Form 1040)
D. Form 1776

MATCHING (Indicate the proper places that entries would be made by selecting and matching. (Use the Illinois Farm Record Book)

H 1. Sold market hogs - $5,000
I 2. Received $8,000 loan from bank
B 3. Paid for heat lamps - $10
A 4. Veterinary Services - $30
L 5. Sold boars - $290 (purchased in 1976)
M 6. Sold corn - $4,000
D 7. Paid for trucking - $100
F 8. Paid for hog supplement - $300
K 9. Sold Wool - $110
G 10. Herbicide for corn - $350

A. Pages 14 and 15, "Total Amount Paid" column and "Livestock Expense" column
B. Pages 14 and 15, "Total Amount Paid" column and "Machinery Repair" column
C. Pages 14 and 15, "Total Amount Paid" column and "Fertilizer and Lime" column
D. Pages 14 and 15, "Total Amount Paid" column and "Machine Hire" column
E. Pages 14 and 15, "Total Amount Paid" column and "Miscellaneous" column
F. Pages 14 and 15, "Total Amount Paid" column and "Feed Purchased" column
G. Pages 14 and 15, "Total Amount Paid" column and "Crop Supplies" column
H. Pages 2 and 3, "Total Amount Received" column and "Sales of Market Livestock, Hogs - Raised" column
I. Pages 2 and 3, "Total Amount Received" column and "Money Borrowed" column
J. Pages 2 and 3, "Total Amount Received" column and "Other Farm Income" column
K. Pages 2 and 3, "Total Amount Received" column and "Eggs, Milk, and Wool" column, and Page 53
L. Pages 2 and 3, "Total Amount Received" column and "Sale of Capital Items, Breeding Stock - Purchased" column
M. Pages 2 and 3, "Total Amount Received" column and "Corn" column
N. Pages 2 and 3, "Total Amount Received" column and "Other Cash Crops" column

COMPLETION (Write appropriate information or words to complete statements.)

1. The two methods of filing income tax returns are the cash and accrual basis.

2. One of the most inclusive measures of a specific livestock enterprise is return per 100 dollars of feed fed.

3. The Illinois Farm Record Book has been designed to provide for income tax reporting and business analysis

4. The straight line method of depreciation has been the one most commonly used.

5. A list of items, quantities, and, values on hand at a particular time is called an inventory.

6. The Illinois Farm Record Book is designed primarily for use by one individual but also provides for keeping the records of a tenant and a landlord.

7. The major analysis measure to obtain for a corn crop is yield per acre.

8. Starting with net farm income, subtract the value of unpaid family labor to find returns for operator's labor, capital, and management.

9. Financial progress during the year and from year to year can be measured by net worth statements.

10. A method of determining depreciation other than straight line is declining balance.

ESSAY QUESTIONS

1. Illustrate and describe how to make an "end of the year" check of hogs to show that all hogs are accounted for.

(see page 7 of subject matter unit)

2. Describe how to calculate operator's labor and management earnings.

(see page 11 of subject matter unit)

UNIT I: AGRICULTURAL BUSINESS MANAGEMENT

PROBLEM AREA: UNDERSTANDING AGRICULTURAL TAXES

SUGGESTIONS TO THE TEACHER:

This problem area does not cover instruction on how to complete federal and state income tax forms and reports although some teachers do teach these topics to their students. Other sources of help are available for this purpose. Vocational Agricultural Service, University of Illinois, has a publication entitled 1984 Income Tax Illustration which is based on the updated Problem for Use with the Illinois Farm Record Book. Also, the Internal Revenue Service has teaching materials and guides to use in teaching students how to fill out income tax forms. Some of these materials are listed in the Teacher's Guide.

Another reason for not including instructional materials on how to figure and report taxes is that the rules usually change each year. Any coverage of rules included in this problem area would not be as complete or accurate as the directions coming directly from Internal Revenue Service.

This problem area is designed to give students an overview of taxes at the local, state and federal level. Those taxes which are most important to agriculture are emphasized. In addition, this problem area includes material on depreciation, depreciation schedules and the accelerated cost recovery system.

In deciding how much time to spend on this problem area, agriculture teachers should check with other teachers in the school system to see if any of this material is taught in other courses.

CREDIT SOURCES:

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The teachers' guide, information sheets and sample test questions were prepared by Paul E. Hemp, Department of Vocational and Technical Education, University of Illinois. Technical information and data used in this problem area were taken from Taxation: Federal, State and Local Systems by C. Allen Bock and David L. Chicoine and from publications from the Internal Revenue Service. For more complete coverage of the topics in this problem area teachers should refer to the sources listed in Section IX of the Teacher's Guide. The transparencies in this problem area were prepared by Vocational Agriculture Service. The following teachers reviewed the original draft of the problem area and provided useful suggestions and guidance:

TEACHER'S GUIDE

I. Unit: Agricultural business management

II. Problem area: Understanding agricultural taxes

III. Objectives: At the close of this problem area students will be able to:

1. List the two major sources of revenue and expenditure for the local, state and federal government.
2. Describe the nature and purpose of the property tax, general sales tax, social security taxes, and tax-sheltered savings.
3. Calculate depreciation problems using both the straight-line and declining balance methods of depreciation.
4. Describe the accelerated cost recovery system and explain how it differs from other methods of calculating depreciation.

IV. Suggested interest approaches:

1. Poll the class to find out what kinds of taxes they and other adults are required to pay and when these payments are made.
2. Ask students if anyone can explain to the class how one can tell how much is withheld from a paycheck for federal tax, state tax and social security.
3. Raise the following thought questions:
    a. "How can an employee reduce his or her federal income tax?"
    b. "What is the difference between a tax exempt return and a tax deferred return?"
    c. "Why do some people say that the only sure things in life are death and taxes?"
4. Explain "The Rule of 72" to the class to show how money saved in an IRA can grow when interest is compounded. See Core IV problem area on "Evaluating SOE Programs and Setting Future Directions" for an Information Sheet on The Rule of 72.
5. Define the intended content of the problem area. This needs to be done before students are asked to identify their problems and concerns.

V. Anticipated problems and concerns of students:

1. Where does the federal government get its money?
2. What are the major areas of federal expenditure?

3. What is the accelerated cost recovery system?
4. How can the ACRS be used in a business to reduce federal tax payments?
5. What is the Keogh plan and how does it work?
6. What is an IRA and what rules govern its use?
7. How can depreciation be calculated?
8. What is the purpose of the Social Security Program?
9. How is social security funded?
10. What are the major sources of revenue for Illinois' state government?
11. What are the major areas of expenditure for state revenue?
12. How is the Illinois State Income Tax calculated?
13. What is the difference between a flat rate tax and a graduated tax?
14. How do local government units generate tax revenue?
15. Why do these units need revenue?
16. How does the government decide how much property tax a property owner must pay?
17. Who collects the local property tax and how is it spent?
18. What is revenue sharing?
19. Where can one get help in completing federal and state tax returns and reports?

VI. Suggested learning activities and experiences:

1. After conducting an interest approach and defining the problem area, have class develop a list of problems and concerns. To vary this procedure, divide class into three buzz groups and have them work on local, state and federal tax problems and concerns.

2. Provide class with appropriate reference materials from the Internal Revenue Service and other sources and have them read and search for answers to the problems and concerns.

3. Use transparencies to give class an overview of sources of revenue and major expenditures of federal, state and local government units.

4. Make a list of important tax terms. Have class look up definitions and report back to class.

5. Obtain tax forms from Illinois Department of Revenue and Internal Revenue Service. Distribute to class and discuss purpose of each form.

6. Have students calculate depreciation using ACRS, straight line and declining balance systems.

7. Divide class into three buzz groups. Have these groups develop a list of ways a farmer, an agribusiness manager and an employee could reduce their tax bills. Ask groups to report back to the class.

8. Invite a tax assessor to the class to explain how farmland and other real properties are assessed.

VII. Application procedures:

1. High school students who were employed during the past year and had taxes withheld from their paychecks need to know how to file a tax return.

2. Some students who have large SOE programs may need to file a tax form.

3. All students will pay taxes in the future and will need to understand tax systems and payment procedures.

VIII. Evaluation:

1. Administer a pencil and paper test and evaluate the results.

2. Evaluate class notes including answers obtained for problem and concerns.

IX. References and aids:

1. 1984 Income Tax Illustration, Vocational Agriculture Service, University of Illinois.

2. Bock, C.A. and Chicoine, D.L. Taxation: Federal, State and Local Systems, AE-4523, College of Agriculture, University of Illinois.

3. Publications from the Internal Revenue Service:

   a. Publication 334 - Tax Guide for Small Business

   b. Publication 225 - Farmer's Tax Guide

   c. Publication 560 - Tax Information on Self-Employed Retirement Plans

   d. Publication 590 - Individual Retirement Arrangements

   e. Publication 534 - Depreciation

INFORMATION SHEET #1

SOCIAL SECURITY TAXES

The Federal Insurance Contributions Act (FICA) provides for a national system of old age, survivors, disability, and hospital insurance. The system is financed through social security taxes known as FICA taxes. FICA taxes are levied on employers and their employees. Employers must collect and pay the tax on their employees by withholding the prescribed amount from employees' checks and sending it along with the employers' share to Internal Revenue Service. In this information sheet, social security tax rates for both self-employed persons such as farm operators and employed workers will be presented.

Self-Employment Tax

Social security benefits are available to individuals who are self-employed just as they are to wage earners. Self-employment tax is a part of a system that provides farmers and other self-employed individuals with social security and hospital insurance (medicare) coverage. In 1984, self-employed persons paid self-employment taxes on the first $35,700 of their self-employment income at the rate of 11.3%. The tax rates and the maximum earnings to be taxed and the maximum tax for selected years from 1955-1984 are as follows:

Year	% Rate	Maximum Earnings	Maximum Tax
1955	3.0%	$4200	$126
1960	4.5%	4800	216
1965	5.4%	4800	259
1970	6.9%	7800	538
1975	7.9%	14100	1114
1980	8.1%	25900	2098
1981	9.3%	29700	2762
1982	9.35%	32400	3029
1983	9.35%	35700	3338
1984	11.3%	37800	4271

The self-employment maximum tax has doubled in the past four years to cover the increasing payouts made to a growing population of retired persons. Self-employed persons can trim their taxes by reducing net earnings. Farmers can hire and pay wages to a spouse or children under 21 thereby reducing net earnings. Children under 21 and a spouse are not subject to the employee tax unless the farm operator is incorporated.

Employment Taxes

Most employers who employ one or more employees are required to withhold and pay the employment tax on their employees. Not all businesses and employees are covered under the Social Security system so specific directions need to be obtained from the Social Security Administration. Employees can observe the amount withheld from their paychecks by referring to the FICA box on their paycheck. In 1983, the tax rate was 6.7% for both the employee and employer. In 1984, the rate increased to 7.0% with a .3% credit to employers when the tax is withheld. The employment tax was levied on the first $35,700 of wages in 1983. The wage base limit was increased to $37,800 in 1984.

Additional information concerning social security taxes can be found in The Farmer's Tax Guide and Tax Guide for Small Business available from the Internal Revenue Service. Also, informational brochures can be obtained from one of the 30 or more Social Security Administration Offices located in the larger cities of the state.

INFORMATION SHEET #2

TAX SHELTERED SAVINGS

Two types of tax sheltered savings programs are briefly described in this information sheet; namely, the Keogh Plan and the Individual Retirement Arrangement (IRA). The Keogh Plan was established for self-employed persons who are not eligible for tax sheltered annuity plans offered to employed persons. The IRA was established in 1981 to enable any person who has earned income to contribute up to $2000 of that earned income each year in an IRA account.

Keogh Plan

The Keogh Plan was established to provide retirement benefits for self-employed persons who are sole proprietors or partners in a partnership and have earned income from personal services which were performed for the business.

Two plans are available. The Defined Contribution Plan permits the contributor to contribute the lesser of $15,000 or 15% of net earnings each year. Beginning in 1984, the limit was increased to $30,000 and 25%.

The Defined Benefit Plan permits annual contributions or deductions based on the investment needed to fund a specific benefit at retirement age. Both of these Keogh plans enable self-employed persons to "shelter" a portion of their income from taxes and to accumulate savings for retirement.

Additional information regarding allowable tax deductions under the Keogh plan can be obtained from the publication, Tax Information on Self-Employed Retirement Plans available from the Internal Revenue Service.

IRA

An Individual Retirement Arrangement (IRA) is a savings program that allows a taxpayer set aside money for retirement. Payments made to an IRA and the earnings of an IRA account are not taxed until the proceeds are withdrawn.

Persons who have earned compensation (wages or salary) can participate. Rental income, interest and dividend income are not considered to be earned compensation. If a person qualifies, the most that can be paid into an IRA each year is $2000. A married person who has a non-working spouse may establish an IRA for him or her and pay no more than $2250 into the two IRA's. Eligible workers can establish and pay into an IRA even though they participate in other retirement plans.

The proceeds of an IRA cannot be withdrawn without penalty until the persons reaches the age of 59½ years, dies or becomes disabled. A taxpayer must start receiving distributions from his or her IRA account by the end of the tax year during which he or she becomes 70½.

Individual Retirement Arrangements are more than a savings program. These plans reduce the amount of taxes that one pays and allows for the investment of the savings in interest-bearing investments. Consider the following example:

> Clarence Jones invests $2000 in an IRA account earning 10% interest. Ed Brown has $2000 to invest in a non-sheltered savings program which also pays 10% interest. Both are in the 35% tax bracket. How much money do each of these investors have at the start of the second year to earn interest?
>
> Mr. Jones will have $2200 to earn interest the second year - the original $2000 investment and $200 interest.
>
> Mr. Brown will have $1384.50. He would have to pay $700 in taxes on the $2000 leaving $1300 to invest. During the first year, he would earn $130 interest but would pay $45.50 in taxes. This leaves $1384.50 available to earn interest during the next year.

Tax sheltered savings programs are subject to many tax rules and regulations not discussed in this information sheet. Additional information is included in the Publication 590, Individual Retirement Arrangements available from the Internal Revenue Service.

INFORMATION SHEET #3

DEPRECIATION

Property is depreciable if it meets all three of the following tests:

1. It is used in a business or to earn rent or royalty income.
2. It has a useful life that can be determined and its useful life is longer than one year.
3. It must be something that wears out, decays, gets used up, becomes obsolete, or loses value from natural causes.

Depreciable property may be real or personal. Personal property is property such as machinery or equipment, not real estate. Real property is land and anything that is erected on land, growing on land or attached to it. Land itself is not depreciable.

In order to figure depreciation, one must know (1) its basis, (2) the date the item was placed in service, and (3) the method of depreciation to be used.

Basis is a measure of the investment in property. Usually it is the purchase price or cost of the property. The basis for property acquired as a gift, inherited or built by the owner must be figured in a different way. After the basis has been determined, events will often happen which cause a need for adjustment. For example, a building may be remodeled making it necessary for the basis to be adjusted. This results in what is known as an adjusted basis.

There are several ways to figure depreciation. A more recent method is the accelerated cost recovery system (ACRS). This method applies to most property placed in service after 1980 and will be discussed in another information sheet included in this problem area.

Two other methods of depreciating property which have been used in the past are the straight-line method and the declining balance method.

The straight line method allows for the deduction of the same amount of depreciation each year. To figure depreciation using the straight line method, follow these steps:

1. Determine the property's basis or adjusted basis, salvage value and estimated useful life.
2. Subtract the salvage value, if any, from the adjusted basis.
3. Divide the balance by the number of years of useful life.

The declining balance method allows one to use a faster method of depreciation but it can only be used on certain types of property. With this method a fixed rate or percentage is applied to the value of the property at the beginning of the year. The rate used in the declining balance method should be near twice that used in the straight line method.

Two other cost recovery methods should be mentioned. Amortization is used to recover only certain kinds of capital expenditures such as research costs, business start up costs and the cost of pollution control devices. Depletion is used to recover the cost of an economic interest in timber, minerals, oil, gas or other natural deposits.

INFORMATION SHEET #4

DEPRECIATION EXAMPLES AND PROBLEMS

Straight Line Depreciation

1. Tractor, new

a.	Original cost	$31,000
b.	Expected life	10 years
c.	Salvage value	$1000
d.	Yearly depreciation	$3000

2. Sprayer, used

a.	Original cost	$2000
b.	Age	5 years
c.	Purchase price	$1000
d.	Cost of repair	$200
e.	Expected life	10 years
f.	Salvage value	none
g.	Yearly depreciation	$120

Declining Balance Depreciation

1. Tractor, new

a.	Original cost	$31,000
b.	Salvage value	$1000
c.	Depreciation rate	20%
d.	Depreciation first year	$6000
e.	Depreciation second year	$4800
f.	Depreciation third year	$3840

INFORMATION SHEET #5

ACCELERATED COST RECOVERY SYSTEM

The accelerated cost recovery system (ACRS) is a newer method of figuring depreciation. Cost recovery is another name for depreciation. The ACRS cannot be used for property placed in service before 1981 but it must be used for tangible property placed in service after 1980 except property obtained through certain types of transactions. These exclusions are described in IRS Publications 225 and 334.

Under ACRS, property is depreciated over a 3-year, 5-year, 10-year, or 15-year recovery period depending on the type of property. Examples of property falling in each classification are as follows:

3-year property -	Automobiles, light duty trucks, breeding hogs, race horses over 2 years of age.
5-year property -	Farm tractors, greenhouses used for commercial plant production, tile drainage systems, concrete ditches used for irrigation.
10-year property -	Real property such as mobile homes and manufactured homes.
15-year property -	Farm buildings.

Deductions under ACRS are figured by multiplying the "unadjusted basis" by the following percentages:

3-year property:

1st year	25%
2nd year	38%
3rd year	37%

5-year property:

1st year	15%
2nd year	22%
3rd through 5th year	21%

10-year property:

1st year	8%
2nd year	14%

3rd year	12%
4th through 6th year	10%
7th through 10th year	9%

Information included here is intended to serve as a brief introduction to ACRS. It should not be used as a guide to calculating cost recovery. Specific rules and regulations from the Internal Revenue Service should be consulted before making out returns involving ACRS.

INFORMATION SHEET #6

ILLINOIS STATE TAXES

Illinois taxes which are most closely related to agricultural workers and entrepreneurs are briefly described in this information sheet.

1. Retailers occupation tax. This is the official name of a tax which is commonly called the "sales tax". It is imposed at the rate of 4 percent on sales of tangible personal property sold at retail. Effective January 1, 1981, the sales tax on food, non-prescription drugs and prescription medical devices was reduced to 3 percent. In addition to the state sales tax, municipalities and counties may levy an additional 1 percent which is collected by the state and returned to the local government unit. Currently (1984), in downstate Illinois, the total sales tax is 3 percent on food and drugs and 5 percent on other items.

   Sales tax is not collected on sales of farm machinery and equipment costing $1,000 or more and sold after September 1, 1981.

   Sales tax is not collected on sales of farm chemicals used in crop production or animal production.

2. State income tax. The General Assembly imposed a state income tax at the rate of 2.5 percent on individuals and 4 percent on corporations in 1969. The rate on 1983 individual income was 3 percent of net income. The state income tax is a flat rate income tax not a progressive or graduated tax.

   While the State of Illinois collects the state income tax, a portion of it is returned to counties and municipalities to help finance education and other functions.

3. Motor fuel tax. This tax is imposed on the privilege of operating motor vehicles on public highways and waterways. Purchasers of motor fuel for this use pay a tax of 7.5 cents per gallon. Proceeds are used for roads, railroad or grade crossings and public highways. Some motor fuels, such as gasohol, may have a reduced tax rate to encourage development and use.

4. Motor vehicle license tax. Fees to purchase license plates for passenger cars and trucks are charged based on horsepower and weight. Fees for antique vehicles and motorcycles are charged as an annual or two-year rate.

Other state taxes levied in Illinois include the public utilities tax, cigarette tax, liquor gallonage tax, coin-operated amusement devices tax, hotel operators tax, insurance premium tax, inheritance tax, horse racing tax, use taxes, corporation franchise taxes, Illinois Control tax, and real estate transfer tax.

INFORMATION SHEET #7

PROPERTY TAX

Local government units in Illinois have the power to levy and collect taxes. There are more than 6000 of these local units including counties, cities, villages, townships, school districts and special districts such as fire protection, forest preserve, park and sanitary districts.

The largest expenditure by local government units is for education. Other services which require heavy expenditures are sewage and sanitation, police protection and highways.

The property tax provides the largest proportion of revenue for local government units in Illinois. Nearly 40% of local government income comes from the property tax. The property which is subject to tax includes farmland, residential and commercial buildings and other structures.

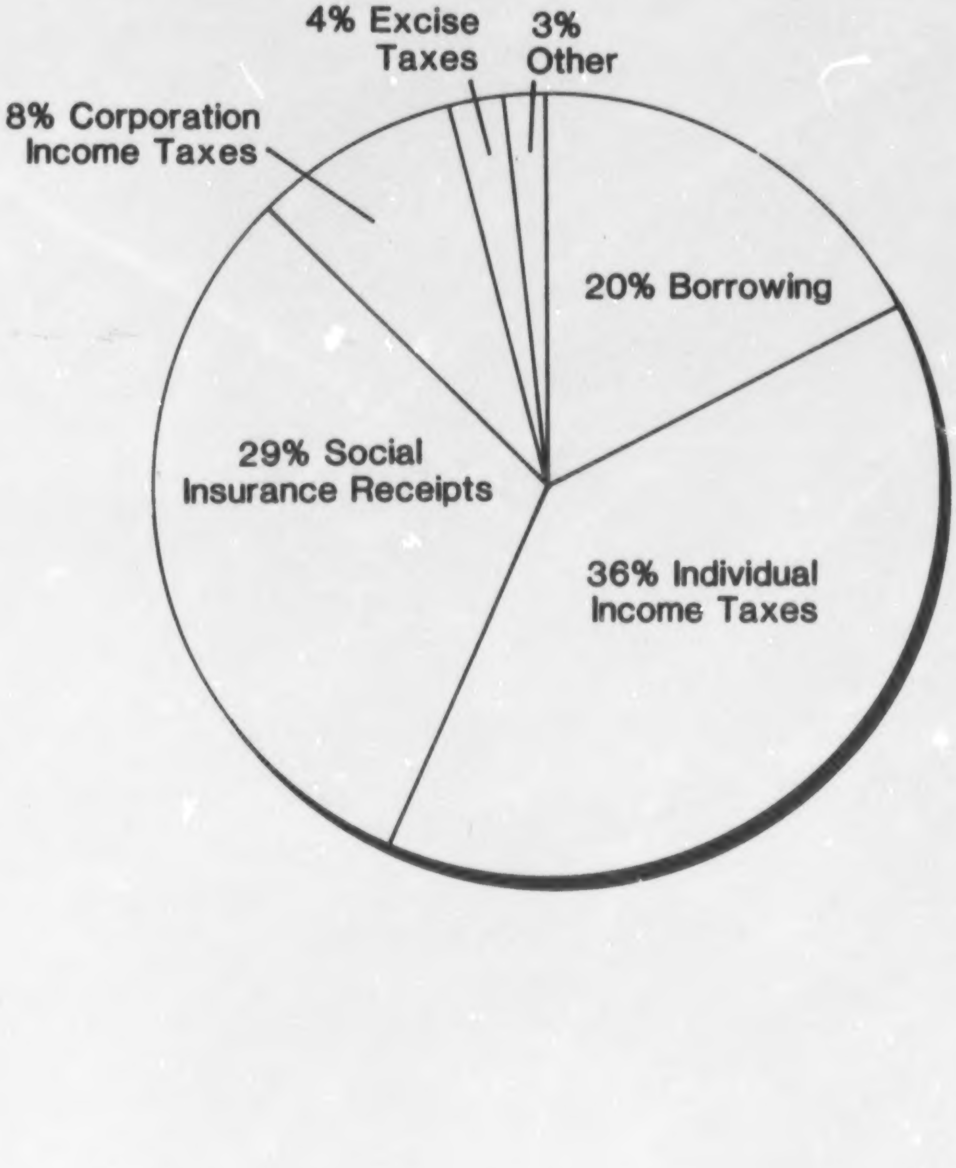
Nonfarmland property is supposed to be assessed at one-third of its fair market value. To guard against unfair or unequal assessments, a board of review has the power to equalize assessments and to hear individual complaints.

The valuation of land is a complicated procedure. Because land may be used for farming or for non-agricultural use, a dual assessment system is utilized. Persons who own land used in farming for 3 preceding years may apply to have the land valued twice, either as farmland or as land to be used for non-agricultural purposes. The owner may then use the lower of these valuations as long as the land continues to be used for farming or agricultural purposes.

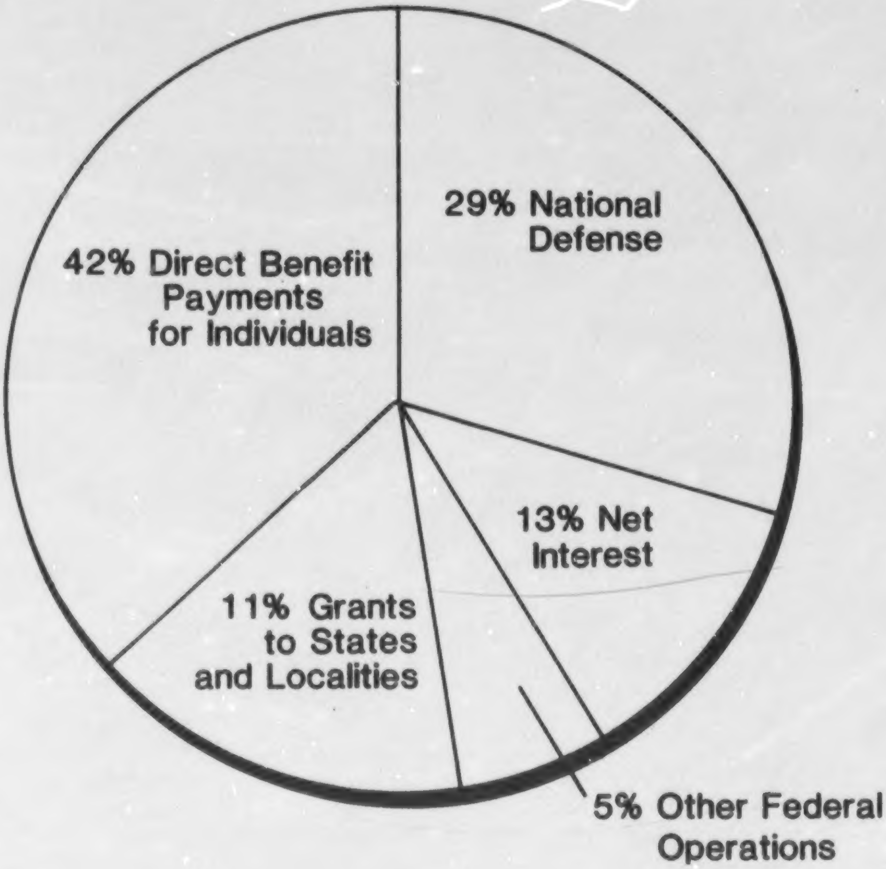
Under Illinois Revised Statutes, a use-value assessment of farm property is permitted. Separate assessments are made on the farm residence, the farm house lot, other farm buildings and productive farmland. A residual income-to-land capitalization approach is used to compute agricultural use-value assessments for farmland. The residual income-to-land is computed by soil productivity index ratings using five-year average nonland production costs and gross grain crop income.

Farmland is reassessed annually. When the assessed valuations are determined in final form the tax rate is applied (multiplied) to calculate the amount of property tax due.

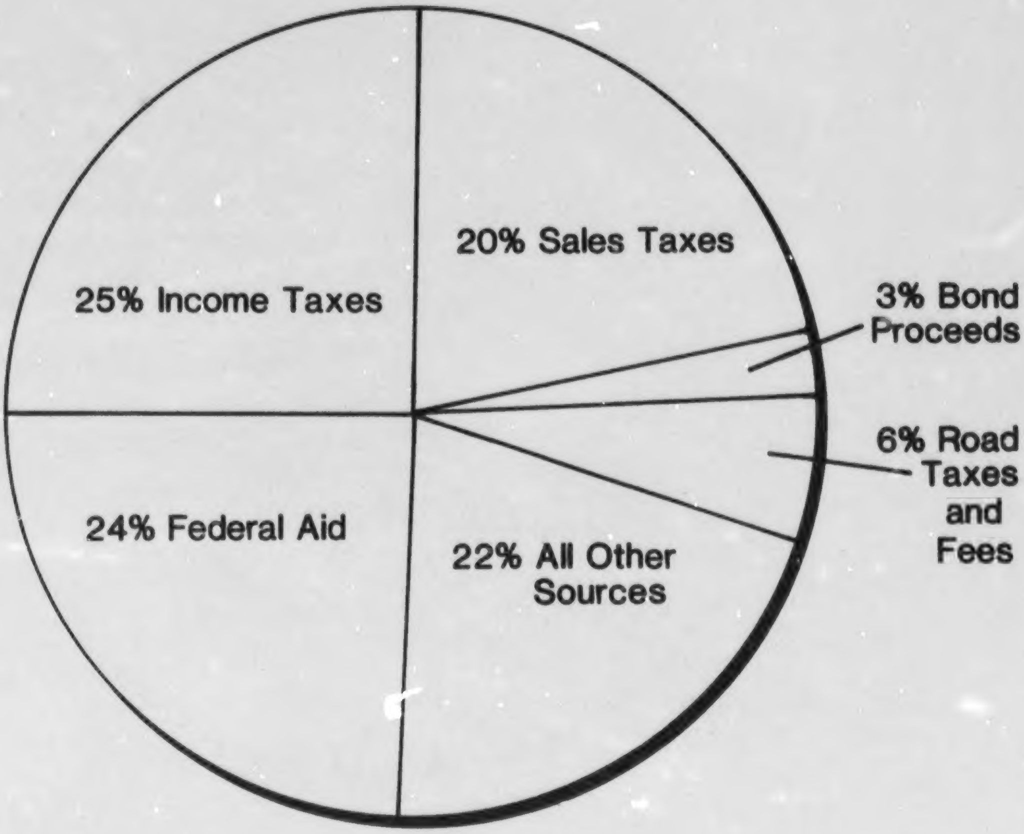
SOURCES OF FEDERAL TAX DOLLARS FY 1985 ESTIMATE



HOW FEDERAL TAX DOLLARS ARE SPENT
FY 1985 ESTIMATE

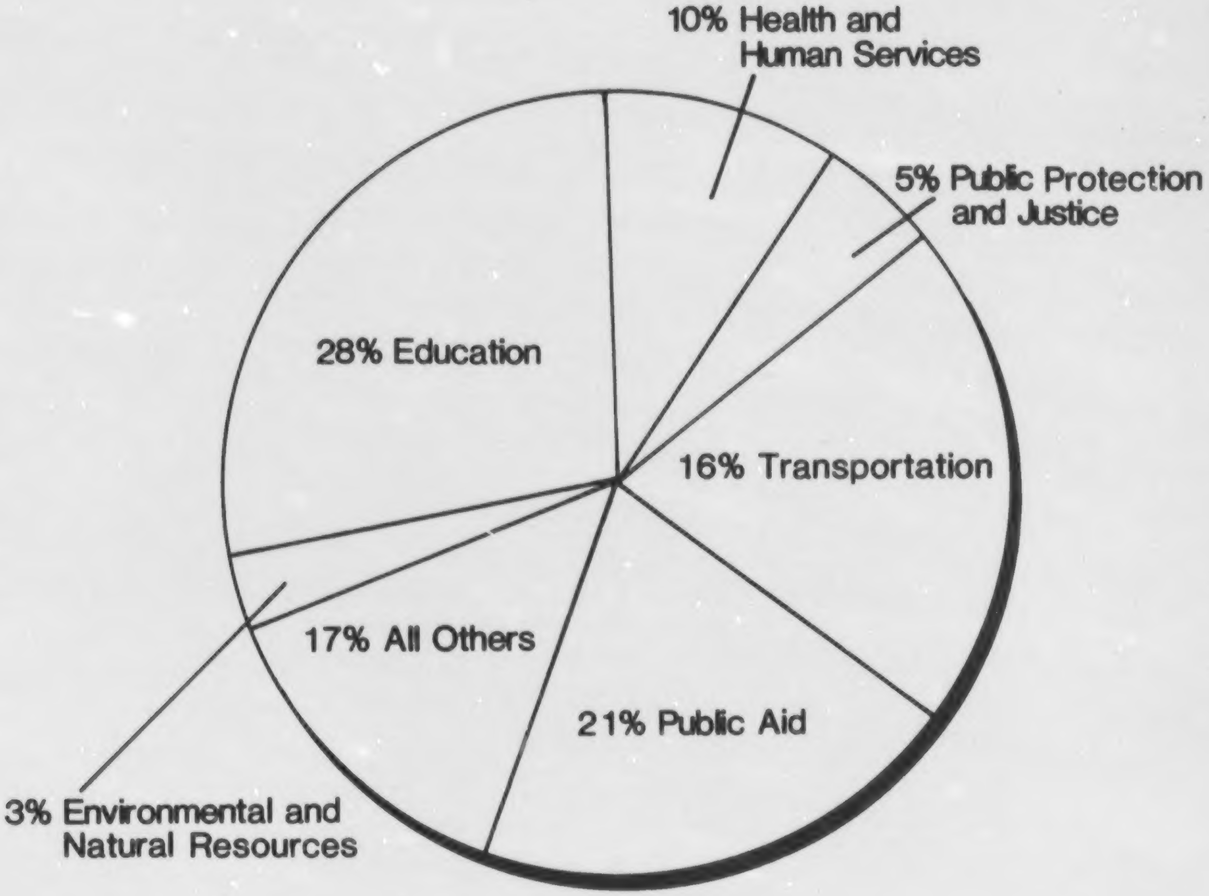


SOURCES OF ILLINOIS REVENUE
FY 1983 PROJECTION



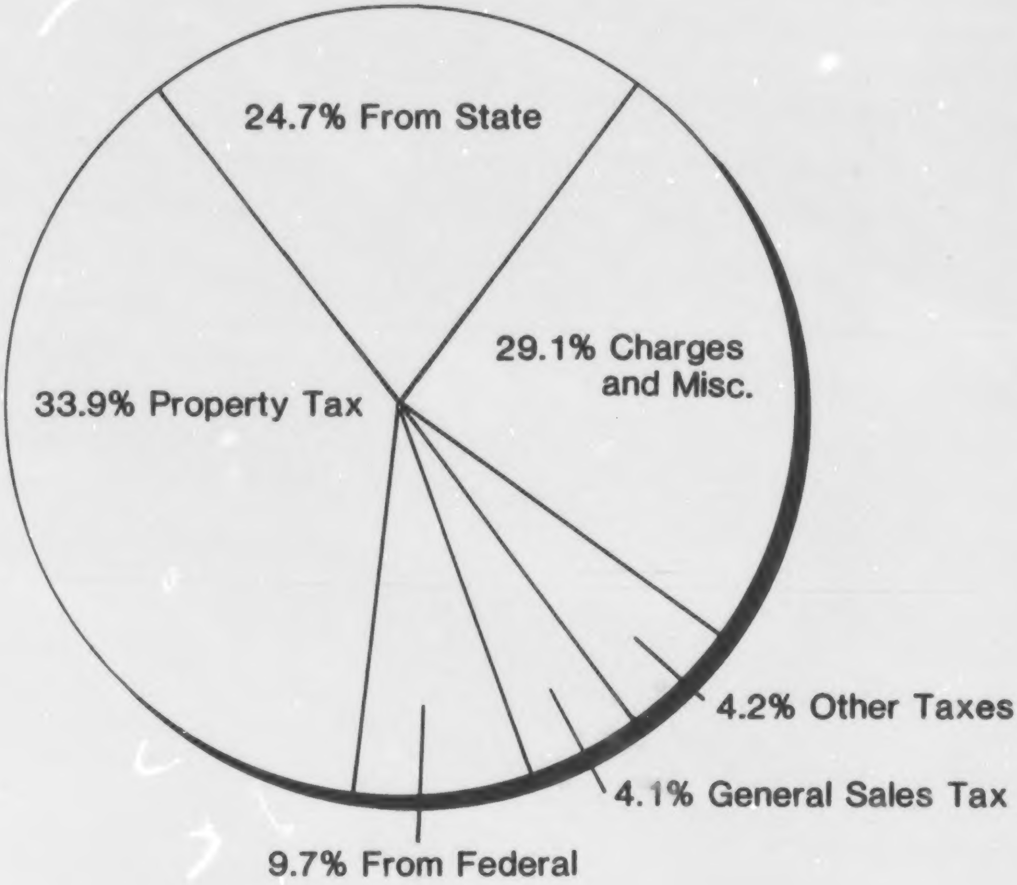
100% $12,537 Million Total

ILLINOIS EXPENDITURES FY 1983 PROJECTION



100% $14,173 Million Total

LOCAL GOVERNMENT INCOME IN ILLINOIS, 1978-79



LOCAL GOVERNMENT EXPENDITURES, 1979

Expenditures	Percentage of Total
Local Schools	36.8
Sewage	8.7
Police	6.1
Highways	5.6
Health	4.2
Higher Education	3.2
Parks	2.9
Interest	2.9
Fire	2.5
Financial Administration	1.6
Welfare	.8
Other	24.3

TRANSPARENCY DISCUSSION GUIDE

UNDERSTANDING AGRICULTURAL TAXES

Information included in the six transparencies presented in this problem area was taken from Taxation: Federal, State and Local Systems by C. Allen Bock and David L. Chicoine, AE-4523, College of Agriculture, University of Illinois, The United States Budget in Brief, and the Illinois State Budget, 1983.

I. Transparency - SOURCE OF FEDERAL TAX DOLLARS

A. The federal government raises revenue by taxation and borrowing. If the federal budget projects a deficit the difference must be borrowed. This adds to the federal debt and increases the amount of interest which must be paid.

B. In 1983, the actual federal budget receipts were slightly over 60 billions of dollars. This does not include the money to be borrowed. Federal outlays for 1983 were 796 billion dollars.

C. The major sources of revenue for the federal government are individual income taxes, social insurance receipts, and corporation income taxes.

II. Transparency - HOW FEDERAL TAX DOLLARS ARE SPENT

A. The largest share of the money spent by the federal government goes for benefit payments to individuals. This includes income security, social services, veterans' benefits and services and other direct payments.

B. National defense will receive approximately 29 percent of the federal tax dollars in FY 85 and revenue sharing (grants to state and local governments) will receive approximately 11 percent of the total.

C. Approximately 13 percent of the federal tax dollars will be used to pay interest on the national debt in FY 85.

III. Transparency - SOURCES OF ILLINOIS REVENUE

A. Federal aid is money which the state of Illinois receives from the federal government. This includes general revenue sharing grants, money for public welfare, education, highways, employment security and other areas. In FY 83, federal aid accounted for 24 percent of Illinois revenue.

B. Sales taxes accounted for approximately 20 percent of the state revenue in 1983. Individual and corporate income taxes accounted for approximately 25 percent of the state's revenue.

IV. Transparency - ILLINOIS EXPENDITURES

A. Approximately 65 percent of government expenditures at the state level went for education, public welfare and highways in 1983.

B. Projected state expenditures in 1983 amounted to 14,173 million dollars.

V. Transparency - LOCAL GOVERNMENT INCOME IN ILLINOIS

A. Local government units include counties, cities, villages, townships, school districts and other special districts. These local government units, for the most part, have the power to levy and collect taxes on their own. The largest generator of revenue for local government units is the property tax.

B. Local government units receive grants from the federal government through revenue sharing and from the state government. In 1978-79, these grants and payments represented about 34 percent of local government income.

VI. Transparency - LOCAL GOVERNMENT EXPENDITURES

A. Local schools and higher education received approximately 40 percent of the expenditures made by local government units in 1979.

B. The remaining amount was used to provide roads and parks, fire protection, welfare, police protection and other services and to pay the administrative costs of operating the more than 6000 local government units in Illinois.

TEACHER'S KEY

SAMPLE TEST QUESTIONS

UNDERSTANDING AGRICULTURAL TAXES

Part I. Completion Questions

1. The letters FICA stand for Federal Insurance Contributions Act.
2. FICA taxes are levied on both the employer and the employee.
3. The largest source of federal tax revenue is the individual income tax.
4. Spending more than you take in is called deficit spending.
5. Interest on the national debt represented approximately 12 percent of the budget in 1981.
6. The term FY 1983 means fiscal year 1983.
7. At the local level, the property tax is the main source of revenue.
8. The largest share of money spent by the federal government goes for benefit payments to individuals.
9. Five examples of local government units are school districts, townships, counties, fire districts, and cities.
10. The amount of taxes owed on real property is determined by multiplying the tax rate times the assessed valuation.
11. A tax which is levied and used primarily for roads and public highways is the motor fuel tax.
12. The measure of investment in property is called basis.
13. ACRS stands for accelerated cost recovery system.
14. A depreciation method which allows for the same amount of depreciation each year is called the straight line method.
15. A depreciation method where a percentage is applied to the value of property at the beginning of each year is called the declining balance method.
16. The cost recovery method used to recover costs of an economic interest such as minerals, oil or gas deposits is called the depletion method.
17. A savings program which defers payment on money invested is called a tax shelter.

18. The IRA program is available only to those persons who have an earned income.

19. Cost recovery is another name for depreciation.

20. Federal income taxes are paid directly to the Internal Revenue Service.

Part II. True (+) - False (o)

+ 1. Social security benefits are available to self-employed persons as well as employed persons.

o 2. The self-employment maximum tax in 1980 was only half of what it was in 1984.

o 3. In 1983, the employment tax was levied on the first $20,000 of wages.

+ 4. Part of the general sales tax collected by the state can be returned to local government units.

o 5. Welfare is the area of highest expenditure for local government units in Illinois.

o 6. In Illinois, individual income taxes generate more revenue than the general sales tax.

+ 7. Land is assessed according to its use.

+ 8. Farmland is reassessed annually.

o 9. The sales tax on food and nonprescription drugs is the same as it is on other items.

+ 10. The Illinois state income tax is a flat rate tax.

+ 11. Real property is land or anything that is erected on land, growing on land or attached to it.

o 12. Land may be depreciated in calculating taxable income.

+ 13. ACRS is a method of figuring depreciation.

o 14. A person who has a Keogh plan cannot invest in an IRA.

o 15. Money invested in an IRA is exempt from federal income taxes forever.

Part III. Tax Problems

Using the information below, calculate annual depreciation using the straight line method.

1. Tractor
   - a. Original cost $53,000
   - b. Expected life 10 years
   - c. Salvage value $3000
   - d. Yearly depreciation ______________

   (Answer is $5000)

2. Computer
   - a. Original cost $8000
   - b. Expected life 10 years
   - c. Salvage value $1000
   - d. Yearly depreciation ______________

   (Answer is $700)

Using the information below, calculate depreciation using the declining balance method.

1. Tractor
   - a. Original cost $36,000
   - b. Salvage value $2000
   - c. Depreciation rate 15%
   - d. Depreciation, 1st year ______________ ($5100)
   - e. Depreciation, 2nd year ______________ ($4335)
   - f. Depreciation, 3rd year ______________ ($3685)

Using the rates given in Information Sheet #1, calculate the following:

1. Amount of self-employment (social security) tax a farm operator who earned $30,000 in 1984 would have to pay.

   __________________________ ($30,000 x 11.3% = $3390)

2. Amount of employment tax a floral shop operator would have to pay on an employee who earned $10,000 in 1983.

   __________________________ ($10,000 x 6.7% = $670)

UNIT I: AGRICULTURAL BUSINESS MANAGEMENT

PROBLEM AREA: USING MICROCOMPUTERS IN AGRICULTURAL BUSINESS MANAGEMENT

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in vocational agriculture programs. This problem area may be taught during the winter months when outside activities are limited.

The estimated instructional time for this problem area is 5 to 10 days. If the students are involved in computer programming activities additional classroom or laboratory time will need to be planned.

Some of the learning activities in this problem area require access to a microcomputer; other activities require previous experience with running microcomputer programs. The instructors are encouraged to modify and adapt these materials to their local situations.

CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-24-D-0362-644 with the Illinois State Board of Education, Department of Adult, Vocational, and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, information sheet, student worksheets, and sample test questions were developed by Janet L. Henderson and Barbara Clayton Koch, Department of Vocational and Technical Education, University of Illinois, and reviewed by Bill Hunter, Vocational Agriculture Service, University of Illinois.

The artwork in this problem area was prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture teachers:

Chris Roegge - Geneseo High School
James Huffman - Western High School
Dale Teel - Westmer High School
Frank Dry - Nashville High School
Richard Schertz - Moweaqua High School
Steve Myers - Lewistown High School

TEACHER'S GUIDE

I. Unit: Agricultural business management

II. Problem area: Using microcomputers in agricultural business management

III. Objectives: At the close of this problem area students will be able to:

1. Define basic computer terminology.
2. Identify the basic parts and functions of a microcomputer.
3. List ways that microcomputers can be used in the agriculture industry.
4. Develop and execute a simple computer program related to an agriculture topic.
5. Evaluate computer software packages designed for agriculture programs.
6. Determine factors to consider when purchasing computer hardware.
7. Identify characteristics of microcomputer software programs.
8. Properly operate the microcomputer and appropriately handle software.

IV. Suggested interest approaches:

1. Discuss with the class how computers affect our everyday lives. Use the following lead questions:
    a. Where do we see computers or computer technology being used? (Example: grocery stores, microwave ovens, dishwashers, video games, gas stations, libraries, banks.)
    b. How have computers affected your life?
    c. What are some advantages and disadvantages of computer technology?
2. If microcomputers are available at the school, demonstrate how to run a simple program. Discuss the capabilities of computers. Encourage students to consider how computers could be used in the agriculture program.
3. Have students keep track of the different ways microcomputers impact their daily lives. Use a short survey form to collect data during a specified time period. Have students share their findings with the rest of the class.

V. Anticipated problems and concerns of students:

1. What is a computer?
2. What are the different types of computers?
3. What are the advantages and disadvantages of using computers?
4. How do microcomputers operate?
5. How can microcomputers be used in a agriculture business?
6. What is meant by computer hardware and software?
7. How do I determine which microcomputer to purchase?
8. How can I evaluate computer software programs?
9. How should I care for a microcomputer?
10. How do microcomputer programs work?
11. Why would I want to own and/or use a microcomputer?

VI. Suggested learning activities and experiences:

1. Have students interview selected agriculture businessmen and women in the local community who use microcomputers in their operations. Use Student Worksheet #1 as a guide for planning appropriate interview questions. Upon completion of the interviews have the students share their findings with the rest of the class. Generate a list of ways microcomputers are currently being used in the local agriculture industry.

2. Invite a local agriculture businessperson to discuss how he or she use microcomputers in their daily operations. Encourage students to ask what computer skills are necessary for entry-level agriculture workers.

3. Have students review current agriculture publications for articles on microcomputers. Let students summarize and share the information with the rest of the class. Keep the articles in a notebook for future reference.

4. Develop a bulletin board using one of the following themes: computer terms, available hardware and software, uses of microcomputers, or capabilities of computers.

5. Discuss the advantages and disadvantages of using microcomputers using Transparencies 1 and 2. Encourage students to add to the lists using their own experiences.

6. Review with students the proper methods of handling floppy disks using Transparency 3.

7. Have students read sections 1, 2, and 5 in VAS Unit 6023--Introduction to Computers in Agriculture. Use Student Worksheet #2 to plan this activity. Review microcomputer terms using the worksheet as a guide for discussion.

8. Organize a study trip to a local agriculture business that uses microcomputers. Observe the different ways of utilizing computers in the business and discuss the advantages. Use Student Worksheet #1 to plan this activity.

9. Have students run a microcomputer program specifically designed for an agriculture business or class. Information Sheet #1 lists sources for purchasing ready-made programs to help in planning this activity. The instructor is encouraged to contact the sources to obtain detailed information on the agriculture programs.

10. Using VAS Unit 6023--Introduction to Computers in Agriculture, Section 3, have students develop a list of rules for storing and using microcomputers. Have students draw and display posters that illustrate the proper care for microcomputer hardware and software.

11. Have students complete Student Worksheet #4--Hardware Evaluation Checklist. Encourage students to compare and contrast the various models of microcomputers currently available. Have students evaluate and identify the best buy for their particular microcomputer needs.

12. Have students complete Student Worksheet #5--Software Evaluation Checklist. Encourage students to consider the strengths and weaknesses of various software packages. Develop a list of additional questions to ask prior to purchasing specific microcomputer programs. This activity is intended for use by students who have a basic understanding of computer terminology.

13. Have students complete Student Worksheet #3--Computer Software using VAS Unit 6025--Selecting Agricultural Computer Software. Review the information using the worksheet as a guide.

14. Have students complete Student Worksheet #6--Using the Microcomputer. This worksheet should be used with the specific microcomputer(s) available for student use.

15. Using Student Worksheet #7--Computer Programming, encourage students to become familiar with basic programming language for their specific microcomputer. How to develop a simple computer program is included in this activity.

VII. Applications procedures:

1. Familiarity with computer terminology and basic manipulative skills will be useful for all students preparing for a career in the agriculture industry.

2. A basic understanding of computers and programming can be helpful in maintaining SOE and/or entrepreneurship records for those students with access to a microcomputer.

VIII. Evaluation:

1. Prepare and administer a written exam using the sample test questions in this problem area.
2. Evaluate performance on the student worksheets.
3. Evaluate student ability to perform specific functions on the microcomputer.

IX. References and aids:

1. Vocational Agriculture Service, College of Agriculture, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois, 61801 (217/333-3871).
    a. VAS Unit 6023--Introduction to Computers in Agriculture.
    b. VAS Unit 6025--Selecting Agricultural Computer Software.
    c. Microcomputer Programs in Agriculture

COMPETENCY INVENTORY

USING MICROCOMPUTERS IN AGRICULTURAL BUSINESS MANAGEMENT

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

Competency	Circle One						
1. Define basic computer terminology.						6	7
2. Identify the basic parts and functions of a microcomputer.						6	7
3. List ways that microcomputers can be used in the agriculture industry.						6	7
4. Develop and execute a simple computer program related to an agriculture topic.	1	2	3	4	5		
5. Evaluate computer software packages designed for agriculture programs.						6	7
6. Determine factors to consider when purchasing computer hardware.	1	2	3	4	5		
7. Identify characteristics of microcomputer software programs.						6	7
8. Operate the microcomputer and appropriately handle software.	1	2	3	4	5		

These competencies are outlined in the National Ag Occupations Competency Study, 1978, for entry level positions in agriculture.

Name Date

INFORMATION SHEET #1

SOURCES OF AGRICULTURE COMPUTER PROGRAMS

1. Vocational Agriculture Service
   College of Agriculture
   University of Illinois
   1401 South Maryland Drive
   Urbana, IL 61801
   (217) 333-3871

2. Illinois State Board of Education -
   Computing Software Documentation Project
   10 Education Building
   1310 South Sixth Street
   Champaign, IL 61820
   (217) 333-8387or (217) 333-6538

3. Various agriculture curriculum material companies and agribusinesses have microcomputer programs in agriculture available for classroom use. Check current resource catalogs for agricultural programs of interest.

STUDENT WORKSHEET #1

BUSINESS INTERVIEW - MICROCOMPUTERS

1. Name and address of business: ______________________________

____

____

2. Nature of business: ______________________________

3. Number of microcomputers: ______________________________

4. Computer model(s): ______________________________

5. Peripheral devices (please list): ______________________________

____

____

6. Source of computer training: (Check all that apply)

____ self

____ high school

____ college

____ on-job

____ military

____ other (specify) __________

7. Uses for the microcomputer:

____ employee records (example: payroll)

____ inventory of crops, animals, equipment and/or supplies

____ sales and marketing analysis

____ management assistance (feed ration calculations, fertilizer recommendations, etc.)

____ customer records (example: billing)

____ financial planning and record keeping (example: budgeting)

____ other (specify) ______________________________

8. Microcomputer skills needed by entry level workers: ______________

____

____

9. Additional Comments: ______________________________

____

STUDENT WORKSHEET #2

MICROCOMPUTER TERMS

(For use with VAS Unit 6023 - Introduction to Computers in Agriculture, Sections 1, 2, and 5.)

1. Mainframe Computers - ______________________________

2. Minicomputers - ______________________________

3. Microcomputers - ______________________________

4. Computer Processing Unit - ______________________________

5. Peripheral Devices - ______________________________

6. Bit - ______________________________

7. Byte - ______________________________

8. Kilobyte (K) - ______________________________

9. Floppy Disk - ______________________________

10. Random Access Memory (RAM) - ______________________________

11. Read Only Memory (ROM) - ______________________________

12. Cathode Ray Tube - ______________________________

13. Non-Impact Printer - ______________________________

____

____

14. Impact Printer - ______________________________

____

____

15. Hardware - ______________________________

____

16. Software - ______________________________

____

17. BASIC - ______________________________

____

STUDENT WORKSHEET #3

COMPUTER SOFTWARE

(For use with VAS Unit 6025--Selecting Agricultural Computer Software.)

1. List the three main types of computer software and briefly define each.

   a. ______________________________

   ____

   b. ______________________________

   ____

   c. ______________________________

   ____

2. Briefly explain why "Z" brand computer may be unable to utilize another company's software.

   ____

   ____

3. How might the problem described in question #2 be corrected while still utilizing opposing brands?

   ____

   ____

4. List the four most common programming languages.

   a. ______________

   b. ______________

   c. ______________

   d. ______________

5. Approximately how many versions or dialects of BASIC exist? ________

6. If you are planning to use your microcomputer primarily to run programs rather than for developing programs, would you purchase a microcomputer with a compiler or an interpreter? Explain your answer.

____

____

7. List and briefly define the three types of application software packages.

   a. ____

   b. ____

   c. ____

8. List eight things you should check when evaluating commercial software packages.

   a. ____

   b. ____

   c. ____

   d. ____

   e. ____

   f. ____

   g. ____

   h. ____

9. Describe the following general commercial programs available for use as agricultural software.

   a. Data Base Management programs- ________________

   ____

   b. Word Processing programs- ________________

   ____

   c. Spread Sheet programs- ________________

   ____

   d. Graphic program- ________________

   ____

10. How might the four general commercial programs discussed in question #9 be used to help you keep records on your SOEP?____________________

____

____

11. Compare the advantages and disadvantages in using commercial, custom, or user-written software.______________________________

____

____

____

12. Where might you obtain information about available software?

____

____

____

STUDENT WORKSHEET #4

HARDWARE EVALUATION CHECKLIST

I. Procedures: Visit a local microcomputer dealer or use available dealer catalogs to complete the following hardware checklist. Circle the appropriate letter in the right-hand column.

Brand Name: ________________________________ Model: _______________

Price: __________________

	Yes	No	Not Applicable
A. Keyboard/Disk Drive/Memory			
1. Sold by a local dealer who provides service.	Y	N	NA
2. Is a name brand computer that has software available.	Y	N	NA
3. Has sufficient memory (at least 64-128K).	Y	N	NA
4. Additional memory capacity can be added if needed.	Y	N	NA
5. Uses a 5¼-inch diskette.	Y	N	NA
6. Can be connected to a phone modem to access other computers.	Y	N	NA
7. Additional disk drives can be added if needed.	Y	N	NA
8. Has adequate graphics capabilities.	Y	N	NA
9. Keyboard keys are clearly marked and easy to operate.	Y	N	NA
10. Will operate a color monitor.	Y	N	NA
11. Price is comparable to similar brands.	Y	N	NA
B. Monitor/Printer			
1. The picture is sharp and clear.	Y	N	NA
2. Monitor has a color screen.	Y	N	NA

	Yes	No	Not Applicable
3. Has desired speed of print. (Dot matrix or Daisy wheel)	Y	N	NA
4. Printer provides graphics capabilities.	Y	N	NA
5. Printer provides letter quality type.	Y	N	NA

II. Procedures: Answer the following questions after completing Part I of the checklist.

1. What do you want to do with the computer? List your goals.

2. Is there a less expensive way to do what you want? Explain.

3. How will repairs and questions about the equipment be handled? Explain.

4. Do you have adequate space and power sources to operate the microcomputer? Explain.

5. Would you purchase the hardware just evaluated? Why or why not?

STUDENT WORKSHEET #5

SOFTWARE EVALUATON CHECKLIST

I. Procedures: Visit a local microcomputer dealer or use a program available at school to complete the following software checklist. Circle the appropriate letter in the right-hand column.

Name of Program: ______________________ Price: ________

Nature of Program: ______________________________

A. General	Yes	No	Not Applicable
1. The program provides the desired output.	Y	N	NA
2. Sold by a dealer or company that provides service.	Y	N	NA
3. Software will operate on desired hardware.	Y	N	NA
4. Software does not require more memory (K) than the hardware has.	Y	N	NA
5. Price is comparable to similar programs.	Y	N	NA
6. The program is free from errors.	Y	N	NA
7. The program can be modified.	Y	N	NA
B. Input			
1. Cursor or other indicator shows where input is to go.	Y	N	NA
2. Input can be corrected if necessary before program continues.	Y	N	NA
3. Error diagnostics are given when improper data is inputted.	Y	N	NA

		Yes	No	Not Applicable
C.	Output			
1.	The output is in an easy-to-read and understand format.	Y	N	NA
2.	Produces output on a printer if desired.	Y	N	NA
3.	Program is in color for color monitors.	Y	N	NA
D.	Instructions			
1.	Documentation is provided in the software package.	Y	N	NA
2.	User can skip instructions and return to them when needed.	Y	N	NA
3.	The text is clear and easy to read.	Y	N	NA
4.	Commands are written in simple-to-understand terms.	Y	N	NA
5.	Uniform terms are used throughout the program.	Y	N	NA
6.	Clear graphics can be used when needed.	Y	N	NA
7.	Sound and/or music is used effectively.	Y	N	NA
E.	Documentation			
1.	Provides easy-to-read, step-by-step instructions.	Y	N	NA
2.	Contains a sample set of data with output to test the program.	Y	N	NA
3.	Contains a tutorial.	Y	N	NA
4.	Provides a list of program's commands.	Y	N	NA

II Procedures: Answer the following questions after running a sample software package.

1. Were there times when you felt explanations were unclear? Explain.

____

____

____

2. Were there times when you felt frustrated using the program? Explain. ______________________________

____

____

3. Were there times when you lost interest in the program? Explain.

____

____

____

4. What features of the program did you most like or enjoy?

____

____

____

5. What features of the program did you least like or enjoy?

____

____

____

6. How could you use this program in your supervised occupation experience program? ______________________

____

____

____

STUDENT WORKSHEET #6

USING THE MICROCOMPUTER

Computer manufacturers design their computers to respond to a unique set of instructions. It is essential for the user to become familiar with the particular commands and procedures for operating the model of microcomputer being utilized.

Procedures: Complete the following student worksheet with the assistance of your instructor and your microcomputer operating manual.

1. Identify the brand and model of your microcomputer. ____________________

____

2. Identify the major components of the microcomputer. ____________________

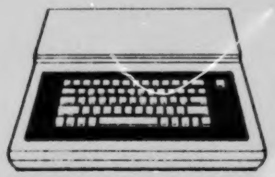
____

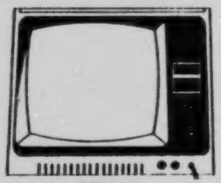
____

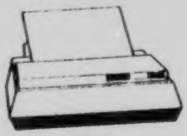
____

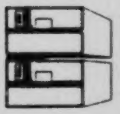
____

Compare and contrast your model to the diagram.


Microcomputer with Keyboard


Monitor


Printer


Disk Drives

3. Locate the power switch(es) on your computer. Place an X in the diagram in question #2 to indicate the power switch(es) location. Briefly describe if necessary. ____________________

____

____

4. Turn the power switch(es) to "ON" for the necessary components.

5. List in the space below any additional sign-on instructions needed for your computer, numbering each step. ____________________

____

____

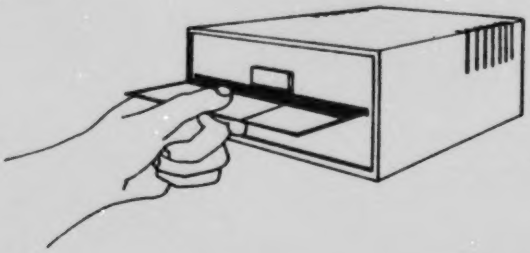
6. Check that the disk drive "in use" light is OFF before proceeding.

7. Determine which disk drive will be utilized when only one diskette is used and two disk drives are available. Identify in the space provided.

____

____

8. Placing fingers on the diskette jacket (label) only, gently remove the diskette from its protective envelope. Hold your right thumb over the label: this will normally insure the correct orientation when you place the diskette on the drive.



9. Carefully, with the label facing up, place the diskette into the open disk drive. The edge of the diskette with the oval cut out in the diskette's square plastic cover should enter the drive first. The edge of the diskette with the label enters the drive last.

10. Slowly and gently close the disk drive door. Closing the door lowers the drive head onto the disk. Care should be taken to avoid damage to the disk and the drive head.

11. List additional directions needed to load the diskette's catalogue onto the workspace and screen. The catalogue is a list of programs stored on the diskette. It may also be referred to as a "Menu".

____

____

____

____

12. Record the steps necessary to execute a program listed in the catalogue.

____

____

____

13. Once you have begun a program, how can you return to the catalogue?

14. List the steps necessary to change diskettes. Caution: NEVER remove a diskette when the "in use" light is on the disk drive.

15. List the steps for printing a program.

16. How can you correct an error in typing?

17. What is a "syntax error" and what should you do if this appears on the screen?

18. List the steps for signing-off of your computer. Caution: NEVER remove a diskette when the "in use" light is on.

19. Carefully store the diskette in a protective envelope in an appropriate location free from dust, temperature extremes, and exposure to magnetic fields. Never place the diskette on top of the microcomputer or its peripherals.

STUDENT WORKSHEET #7

COMPUTER PROGRAMMING

A computer program is a list of detailed instructions given by the programmer to the computer which describes a process to be performed. The program is written in a computer language specific to the computer model being used. Many personal microcomputers utilize a language called BASIC (Beginners All-purpose Symbolic Instruction Code) which allows the programmer to communicate with the computer. Although many computers utilize BASIC, there are many variations (dialects) of BASIC used by different manufacturers; therefore, the system commands will vary. The system commands for your computer can be found in the operator's manual.

Procedures: With the assistance of your instructor, complete the following worksheet on your microcomputer, utilizing the operator's manual when necessary. List instructions and fill in the blanks as you proceed.

1. Sign on the computer.

   Instructions: ____

   ____

   ____

2. When the computer is ready it will show a welcome or ready message on the screen and the "in-use" light will be off on the disk drive.

3. Type:

* *

```
100  REM   This is a discovery program for agriculture students.
           Barb Koch.  February 26, 1985.
```

* *

What you have typed in step #3 is called a program line. Each line has a line number. What is the line number used in step #3? ____________
The line number is used by the computer to order each line in the program.

4. After typing a program line onto the screen always check it for accuracy. Remember you can correct errors utilizing the appropriate arrow (⟶, ⟵) key.

5. Once the line has been typed and edited it must be entered into the computer's workspace.

* *

To enter a program line press the RETURN bar.

* *

Now enter line 100.

6. Type the following program lines being sure to enter each line separately. Be certain to copy each line exactly and to edit each line for errors <u>before</u> entering each line.

```
110  LET    A = 2
120  LET    B = 1
130  LET    C = A * B
140  PRINT  C
150  END
```

* *

7. To get a clear display of the program lines you have entered in the workspace type: LIST--then press RETURN to enter the system command.

* *

8. If steps 1-7 are correctly completed, the following should be printed on the viewing screen:

```
100  REM    This is a discover program for agriculture students.
            Barb Koch.  February 26, 1985
110  LET    A = 2
120  LET    B = 1
130  LET    C = A * B
140  PRINT  C
150  END
```

9. Re-check the program lines for errors. If an error appears in any line simply retype and enter the appropriate line number.

10. The program lines comprise a program. By reading the statements after each line number, determine what the program will have the computer do. Write your prediction on the line below.

____

____

* *

11. To execute the program in the workspace type: RUN and press RETURN.

* *

12. What happened? ____

____

13. Type and enter:

* *

```
     100  LET  A = 56
```

* *

14. Display the program in the workspace. (Refer to Step #7.)

15. If you execute the program now, what do you think will happen?

____

____

16. Execute the program. (Refer to Step #11.) What happened?

____

____

17. Type and enter:

* *

```
     100
```

* *

18. Again display the program in the workspace. (Refer to Step #7.)

19. What has happened to line 100?

____

____

20. By entering a line number only you can erase the corresponding line in your program.

21. Execute the program in the workspace. (Refer to Step #11.)

22. Has anything changed in the computer's output? ______________________

____

23. Line 100 was a REM statement. REM stands for "remark." A REM statement is listed in a program as a remark or reminder to the programmer. A REM statement is used to document information concerning the designer and date of a program, the purpose of a program, or to explain portions of the program. It is ignored when the computer executes the program; thus, its presence or absence makes no difference in the computer's output.

24. Refer to Step #8. What was the remark the programmer wrote on line 100?

____

____

25. Re-enter a REM statement on line 100 that includes your name and the date. Display the program to check your work.

26. Type and enter:

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

     120  INPUT  B

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

27. Display the program in the workspace. What do you think will happen now?

____

____

28. Execute the program in the workspace. What appears on the screen?

____

____

29. What line do you think is generating the question mark? ______________

30. The INPUT command in line 120 generates the question mark. The computer is asking the user for information, in this case a number. The INPUT command allows the user to change the problem the computer will answer. The number given by the user will be represented by the letter B in the formula.

31. Type and enter: (any number using numerical digits, example 10.)

32. What happened? ____

____

Why? ____

____

33. Re-execute the program several times. Is the number always being doubled?

34. Type and enter:

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
   115  PRINT  "How many bushels of corn will be shipped";

   140  PRINT  B; "  bushels being hauled will weigh  "; C; "  pounds"
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

35. Display the program in the workspace. What happened to the program line numbers? ____

____

36. The line numbers enable the computer to place the program lines in the correct numerical order even though they have been entered out of sequence. This allows the programmer to go back and add lines to a program as desired. By assigning numbers that are in increments of ten or more the programmer provides space for adding lines later if desired.

37. Reviewing the display, what do you predict will happen if the program is executed? ____

____

38. Execute the program and record the output.

39. Information placed inside the quotation marks following the PRINT command will be printed on the screen as is done by line 115 and line 140. The semi-colon used in line 115 after the quotation marks will cause the input question mark to appear at the end of the question. Re-execute the program to check that the question mark appears at the end of the question.

40. Retype line 115 omitting the semi colon at the end. Execute the program. What has changed?

41. Display the program again. Carefully read line 140. Explain why the B and C are not included in the quotation marks.

If you are unsure, try retyping the line putting quotes around the letters B and C. What changes occurred?

42. The END statement is not necessary for all computers but some computers require its presence. Erase line 150. (Refer to step #20.) Execute the program. What happened?

Is the END statement necessary for your computer?

43. If the computer is turned off the program will be erased permanently. The only way to save the program for future use is to store it on the diskette. To store the program you will need to obtain an initialized diskette with available space from your instructor.

44. List the steps for saving or storing a program on the diskette.

45. Store the program on the diskette and check the diskette's catalogue to be certain it has been stored properly before continuing.

46. To begin a new program the computer's workspace must be cleared of the old program.

* *

To clear your computer's workspace type and enter: ________________

* *

47. Using the space provided, develop a program that would figure the area of a field that is 1742.4 ft. long and 1000 ft. wide. Use "W" to represent the field's width and "L" to represent the field's length. Start with line 100 and be sure to include a REM (remark) statement and an END statement.

48. Enter, display, and check your program.

49. Execute the program. Did it work properly? Make corrections if necessary.

50. Now change the program so that it prints the area of the field in terms of acres rather than square feet. Clue: there are 43560 sq. ft. in an acre. List the program change necessary to compute the answer into acres in the space below.

____

____

51. Implement the necessary changes. Display the program and check for errors.

52. Execute the program. What answer was printed? ____________________

53. The answer should be 40.

54. Now change the program so it will compute the acreage of any size field using lengths and widths entered by the program user. List the changes below.

____

____

55. After entering and checking the changes made in your program, execute the program. If the program is correct you should be able to enter 1500 and 871.2 to get an answer of 30 to appear on the screen.

56. Add lines so that an appropriate question appears prior to each input question mark. (Refer to Steps #34-41.) Write the changes in the space below.

57. Change the program so that the word "acres" follows the output answer printed on the screen.

58. Store your program on a diskette. (Refer to Step #44.)

59. Print the display of your program and its execution. (Refer to Step #15 of Student Worksheet 6.)

TEACHER'S KEY

STUDENT WORKSHEET 2

MICROCOMPUTER TERMS

(For use with VAS Unit 6023 - Introduction to Computers in Agriculture, Sections 1, 2, and 5.)

1. Mainframe Computers - very large and expensive computers; introduced in the 1950s; housed in specially-designed rooms; cost over $100,000.
2. Minicomputers - smaller units than mainframe computers; introduced in the mid-1960s; range in price from $10,000 to $25,000.
3. Microcomputers - a small-size computer; operates using an electric, silicon chip; units can be mass produced; relatively low cost.
4. Computer Processing Unit - major component of a computer system; housed inside the unit that holds the keyboard; processes all data.
5. Peripheral Devices - any device connected to the computer; examples include printers, video screens, and memory storage units.
6. Bit - a single signal; smallest unit of information recognized by the computer.
7. Byte - a group of eight bits; one character equals one byte.
8. Kilobyte (K) - one thousand bytes or units of information; referred to as K of memory.
9. Floppy Disk - a magnetic disk used for memory storage; sealed in a square jacket measuring 5¼ inches; uses a disk drive to play the diskette; one disk can store between 80,000 to 500,000 bytes of information.
10. Random Access Memory (RAM) - storage units into which data can be written or read.
11. Read Only Memory (ROM) - storage areas that are permanently wired to perform one function or contain specific data.

12. Cathode Ray Tube - video monitor; referred to as CRT; television sets can be used as monitors.

13. Non-Impact Printer - inexpensive dot matrix printer; a thermal printer; uses heat sensitive paper and hot wire printing head; costs between $400 and $500; paper is expensive and will discolor and fade in heat and sunlight.

14. Impact Printer - most popular type of dot matrix printer; ranges in price from $400 to $2,000; uses regular paper and has excellent quality of type.

15. Hardware - the physical equipment in a computer system; examples include disk drives, keyboard, monitor, and printer.

16. Software - programming designed for use with a microcomputer; programs come with a manual explaining the specifics of the program.

17. BASIC - a type of computer language; stands for Beginner's All-purpose Symbolic Instruction Code.

TEACHER'S KEY

STUDENT WORKSHEET #3

COMPUTER SOFTWARE

(For use with VAS Unit 6025--Selecting Agricultural Computer Software.)

1. List the three main types of computer software and briefly define each.
   a. Operating system software. Controls the basic operation of the computer and its peripherals. Translates electric impulses into a computer process or action.
   b. Programming language software. Provides a language for people to communicate more easily with code-operated computers.
   c. Application software. Computer programs purchased by the user to perform particular functions.
2. Briefly explain why "Z" brand computer may be unable to utilize another company's software.

   The operating system is not compatible with the programming language used in developing the application software, making it impossible for the computer to decode the software being used.
3. How might the problem described in question #2 be corrected while still utilizing opposing brands?

   A translator system could be added that would decode one language into another. The use of a standardized microcomputer operating system, CP/M (Control Program for Microcomputers), could eliminate the problem.
4. List the four most common programming languages used.
   a. Fortran
   b. Cobol
   c. Pascal
   d. Basic

5. Approximately how many versions or dialects of BASIC exist? 125

6. If you are planning to use your microcomputer primarily to run programs rather than for developing programs, would you purchase a microcomputer with a compiler or an interpreter? Explain your answer.

   A compiler. It is much faster when using programs, although it is quicker to debug a program by using an interpreter.

7. List and briefly define the three types of application software packages.

   a. Canned or commercial software. Ready-made programs.

   b. Custom software programs written from scratch by a professional programmer for a specific purpose.

   c. User-written software. Software packages developed by a manager for use in a business.

8. List eight things you should check when evaluating commercial software packages.

   a. Use it for an extended period of time.

   b. Examine the program documentation.

   c. Examine user documentation.

   d. Check for hardware-software compatibility.

   e. Utilize sample problems to check program accuracy.

   f. Check for technical information accuracy.

   g. Determine who will provide necessary support for the program.

   h. Determine how program updating can be accomplished.

9. Describe the following general commercial programs available for use as agricultural software.

   a. Data Base Management programs - Used to store and process raw data. Considered an electronic file cabinet.

   b. Word Processing programs - Composes letters and documents on the computer.

   c. Spread Sheet programs - Used to do mathematical manipulations of numbers. An electronic scratch pad.

d. Graphic program. A program that will plot bar, line, and scatter graphs.

10. How might the four general commercial programs discussed in question #9 be used to help you keep records on your S.O.E.P.? ______

Answers will vary.

______

______

______

11. Compare the advantages and disadvantages in utilizing commercial, custom, or user-written software. Commercial programs are easy to obtain, but are not specific for individual use. Custom programs are more costly than commercial programs. User-written programs are very specific for individual use, but are time consuming to develop.

12. Where might you obtain information about available software?

Computer dealers and companies, state universities, computer magazines, cooperative extension service, community colleges, agricultural companies and financial institutions.

TEACHER'S KEY

STUDENT WORKSHEET #7

COMPUTER PROGRAMMING

3. 100

19. It has been erased.

22. No

24. REM. This is a discovery program for agriculture students. Barb Koch. Feb. 26, 1985.

35. The program lines were placed in correct numerical order.

40. The question mark appears on the line below the question.

41. The B and C represent inputs that vary. If placed inside the quotation marks the letters are printed in the output rather than the variables that they represent.

47.

```
100  REM    (an appropriate statement including name and date)
110  LET    L = 1742.4
120  LET    W = 1000
130  LET    A = A * W
140  PRINT  A
150  END
```

50.

```
130  LET  A = L * W / 43560
```

54.

```
110  INPUT  L
120  INPUT  W
```

56.

```
105  PRINT  "What is the length of the field";
115  PRINT  "What is the width of the field";
```

57.

```
140  PRINT  A; "  acres"
```

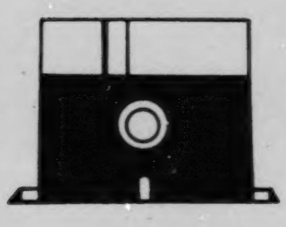
Advantages of Microcomputers

1. Microcomputers can do routine tasks faster than humans
2. Microcomputers make fewer mistakes than humans
3. Microcomputers can play games
4. More work can be produced for less money by a properly-used microcomputer
5. Microcomputers can efficiently handle large amounts of programmed information
6. Once started, microcomputers can operate by themselves

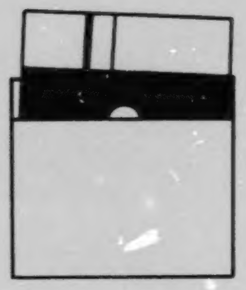
Disadvantages of Microcomputers

1. Microcomputers can not handle unprogrammed situations
2. Microcomputers are not efficient for one-time problems
3. Microcomputers can occasionally break down
4. Microcomputers are dependent on a power source and controlled environment

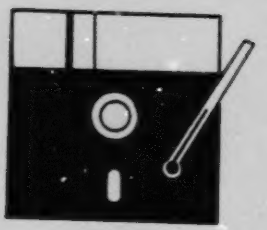
Handling a Floppy Diskette



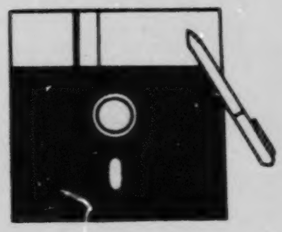
BE SURE TO INSERT CAREFULLY



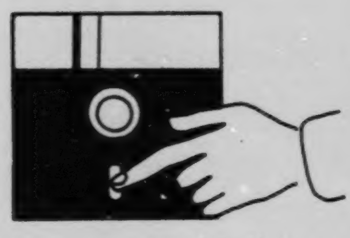
KEEP IN PROTECTIVE ENVELOPE



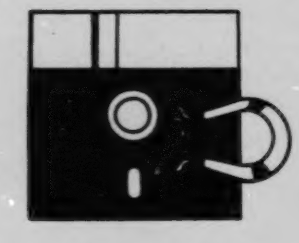
KEEP TEMPERATURE BETWEEN 50°F TO 125°F



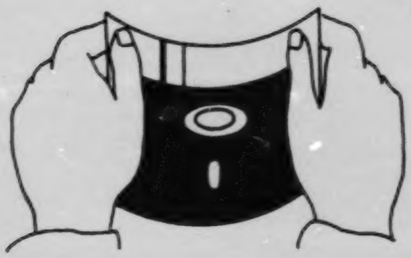
ONLY WRITE ON ENVELOPE WITH A FELT TIP PEN



DO NOT TOUCH DISKETTE



KEEP AWAY FROM MAGNETIC FIELD



NO BENDING OR FOLDING

TEACHER'S KEY

SAMPLE TEST QUESTIONS

USING MICROCOMPUTERS IN AGRICULTURE BUSINESS MANAGEMENT

PART I. MULTIPLE CHOICE:

__C__ 1. The three common languages used in programming computers include:

A. Fortran, Basic, and Aramat.

B. Pascal, Aramat, and Basic.

C. Fortran, Cobol, and Basic.

D. Aramat, Pascal, and Cobol.

__B__ 2. A program developed by a local computer specialist to calculate your personal business records would be considered:

A. commercial software.

B. custom software.

C. user-written software.

D. none of the above

__C__ 3. The general program that is used to do mathematical manipulation would be:

A. data base management.

B. word processing.

C. spread sheet.

D. graphics.

__C__ 4. The smallest unit of information recognized by the computer is called a:

A. microbyte.

B. byte.

C. bit.

D. kilobyte.

C 5. An example of a peripheral device for the microcomputer would be a:

A. disk.

B. byte.

C. printer.

D. computer processing unit.

D 6. Which term is used to describe the physical components in a computer system, such as a keyboard:

A. computerware

B. software

C. systemware

D. hardware

PART II. SHORT ANSWER:

1. Why do most programmers skip 10 or more lines between program lines?

So the programmer can go back and add lines to a program as desired; to make additions and correction in the program.

2. PRINT is the command used which will tell the computer to put information on the viewing screen.

3. List four questions you would ask before purchasing software.

   a. Does the program provide the desired output?
   b. Is the program free of errors?
   c. Can the program be modified?
   d. Are the commands easy to understand?

4. What are the advantages and disadvantages of writing your own program?

   a. Advantages: less cash outlay
      tailor to own needs
      readily changeable
   b. Disadvantages: time-consuming
      may be expensive in terms of lost production

5. Write a simple program that would calculate the total price (P) for (G) number of pounds of grass seed purchased at (U) price per pound.

```
100  REM    The program will calculate grass seed price.  Dale
            Willy.  February 25, 1985.
110  INPUT  G
120  INPUT  U
130  Let P = G * U
140  PRINT  P
150  END
```

6. List four questions to ask before purchasing computer hardware.

   a. Does the model have sufficient memory for my needs?

   b. Does the model have adequate graphics capabilities?

   c. Is the picture clear and sharp on the monitor?

   d. Are the keyboard keys clearly marked and easy to read?

PART III. MATCHING:

Column I

D 1. The command used for a program line that serves as a reminder about the program or its components.

G 2. A command used in a program line that allows the program user to insert information into the program.

B 3. Computer programs purchased by the user to perform particular functions.

A 4. A standardized microcomputer operating system.

E 5. Controls the basic operation of the computer and its peripherals.

H 6. A group of eight bits; one character.

J 7. Example of a peripheral device.

K 8. Major component of a computer system housed inside the keyboard.

Column II

A. Control Program for Microcomputers (CP/M)
B. Application software
C. LET
D. REM
E. Operating system
F. Programming language software
G. INPUT
H. Byte
I. Kilobyte
J. Printer
K. Computer Processing Unit
L. Cathode Ray Tube
M. Mainframe

PART IV. TRUE or FALSE: (+ = true and o = false)

o 1. The "in-use" light should be on when removing or inserting a diskette into the disk drive.

o 2. If line 120 in a computer program is entered into a program after line 140, line 120 will be read by the computer after line 140.

o 3. The RUN command will list the program lines on the screen.

+ 4. A compiler will run a program more quickly than an interpreter.

o 5. Microcomputers can quickly handle large amounts of unprogrammed data.

+ 6. A floppy disk is a magnetic device used for memory storage.

+ 7. Impact printers use regular paper and have excellent quality of type.

PART V. ESSAY

1. Identify and briefly discuss the features you would consider in selecting microcomputer hardware for your business or personal use.

   (Refer to Student Worksheet #4, Hardware Evaluation Checklist.)

2. Identify and briefly discuss the features you would consider in selecting microcomputer software for your business or personal use.

   (Refer to Student Worksheet #5, Software Evaluation Checklist.)

UNIT I: AGRICULTURAL BUSINESS MANAGEMENT

PROBLEM AREA: UNDERSTANDING BASIC AGRICULTURAL LAW AND LEGAL LAND DESCRIPTIONS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during the early winter when farm sales are most prevalent.

The estimated instructional time for this problem area is 10 to 15 days depending on how far the teacher wishes to go in developing knowledge and skills in agricultural law. If the students are to be involved in other exercises, the instructional time will need to be increased. These materials were selected and developed with the following assumptions:

A. Students will develop an appreciation for the complexity of the law and the necessity of legal counsel.
B. Due to the frequent revision of laws it is advisable to have students develop a basic awareness of the many aspects of law affecting agriculturalists and the source of these laws.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

CREDIT SOURCES:

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The teacher's guide, student worksheets, job sheets and transparency discussion guide were developed by: Barb Clayton Koch, Department of Vocational and Technical Education, University of Illinois with assistance from Dave Erickson, vocational Agriculture Instructor - R.O.V.A. High School.

The artwork and sample test questions in this problem area were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the following vocational agriculture teachers:

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TEACHER'S GUIDE

I. Unit: Agricultural business management

II. Problem area: Understanding basic agricultural law and legal land descriptions

III. Objectives: At the end of the problem area, students will be able to:

Land Surveys and Descriptions

1. Identify and discuss the two major systems of land surveys and descriptions used in the United States.
2. Define terminology used in a rectangular survey system.
3. Locate a given piece of property on a plat book by its rectangular survey legal description.
4. Demonstrate their understanding of the rectangular survey system by correctly describing a given tract of land.

Property

5. Define the legal tools used to transfer property ownership and describe the process for making a property transaction.
6. Discuss the importance of estate planning and providing a will.
7. Identify the legal rights and responsibilities of a property owner.

Landlord and Tenants

8. List and describe the types of rental agreements including the requirements which make them legally enforceable.
9. Compare the legal obligations of the landlord and the tenant.

Farm Labor

10. Identify the legal responsibility of an employer for farm laborers.

Drainage and Water Rights

11. List the benefits of the local drainage districts.
12. Identify the legal responsibilities a landowner has for water on his/her property.

Fences

13. Describe the extent of a farmer's responsibility for constructing and maintaining legal fences.

Livestock

14. Cite the criterion used to determine an animal owner's liability for damages due to roaming animals.

Animal Diseases

15. List the animal diseases that are governed by law.

16. Identify the legally required actions necessary for controlling disease.

Environmental Protection

17. Discuss the reasons for and agricultural aspects of environmental protection.

IV. Suggested interest approaches:

1. Read the rectangular survey description for a known property (school, ag plot, student's farm) and ask students to identify the property. Explain the importance of being certain of a land description when purchasing land.

2. Ask a student to describe their land to another student unfamiliar with the property being described. Have the student try to locate the land and its boundaries on a county map from the description given.

3. Show the class a bill of sale for a farm sale. Ask them if they can find the land which will be sold according to its legal description.

4. Devise a sample problem that might arise and ask the students to determine who is legally liable and to what extent they are liable. Example: "Craig Schrieber is Beth Waters' neighbor. Craig's Angus bull escapes and services three of Beth's registered shorthorns. Who is liable and what if any damages should be awarded?"

5. Read an article from a newspaper, magazine, etc. that discusses a recent farm law case. (The more controversial the better.) Draw students into discussing the problem by asking lead questions.

6. Utilizing information from an area lawyer, illustrate the financial benefits of estate planning or have students choose how they would like to inherit money.

a) $50,000/year for 10 years

b) $50,000 in one year

As a class, discuss the pros and cons of each choice.

7. Utilizing an example of a traffic violation (i.e., Car A runs a red light and hits Car B), ask the following questions:

   1) If the driver was "unaware" of the law should the driver still be at fault?

   2) Why is this traffic law necessary?

   3) Who benefits from the law?

   4) Who makes laws? Can they be changed? How?

   5) Who enforces the law?

   6) Who pays to have laws enforced?

   7) Why do we need laws covering agriculture?

   8) What aspects of agriculture are covered by laws?

8. Have students clip out newspaper and magazine articles concerning legal problems of farmers and/or other agriculturalists. Display on the bulletin board and discuss as a class.

9. Divide the class in half, one half of the students will be property owners and the other half renters; as a group draw up a lease. Discuss what should be included.

V. Anticipated problems and concerns of students:

Land Surveys and Descriptions

1. What is a legal land survey and why do we need it?

2. How does the metes and bounds system differ from the rectangular survey system?

3. How is a tract of land described using each of the land description systems?

4. What terminology is used in legal land descriptions?

5. What causes irregular townships and sections?

Property

6. How is property transferred from one owner to another?

7. How can a property owner be certain that s/he have all legal claims to the property?

8. Why is it important to have a will?

9. What do I need to do to have an updated will?

10. What is estate planning and why is it important?

11. How is property tax determined?

12. What legal rights and responsibilities does a property owner have?

Landlord and Tenants

13. What information should be included in a lease?

14. What happens when a lease expires?

15. What if there is no written lease?

16. What happens when either party breaks the lease?

17. How is ownership of improvements to property determined?

Farm Labor

18. How are wages determined for farm workers?

19. Should farm laborers have a contract?

20. How is liability for a job related injury determined?

21. Are farm laborers covered by the Unemployment Compensation Act? Why or Why not?

Drainage and Water Rights

22. What can landowners legally do with water draining onto and off of their property?

23. What is a drainage district?

24. Why are drainage districts needed?

25. What are a property owner's rights and responsibilities for ground water?

Fences

26. What is a legal fence?

27. Who is responsible for a division fence?

28. When is a farmer not legally responsible for establishing or maintaining a division fence?

Livestock

29. How is liability determined for straying farm animals trespassing on neighboring property or obstructing roadways?

30. What happens when the roaming animal's owner is unknown?

31. What laws govern dogs?

32. What constitutes cruelty to animals in Illinois?

Animal Disease

33. Why must there be laws governing diseased animals?

34. What animal diseases are covered by the law?

35. What steps does the law take to help prevent the spread of these diseases?

36. Who pays the costs incurred to stop disease spread?

Environmental Protection

37. Why are there laws to protect the environment?

38. Who enforces environmental protection laws?

39. What laws govern the application and use of ag chemicals?

VI. Suggested learning activities and experiences:

General

1. Select areas to be covered in Agriculture Law and Legal Land Descriptions appropriate to the local area.

2. Gather references and locate any supplementary materials to use with this problem area.

3. Ask students to develop a list of questions during the course of the problem area. Students will present these questions to a lawyer appearing as a guest speaker at the conclusion of the problem area. The class may wish to "brainstorm" questions covering areas of agricultural law that are not covered in the unit (i.e. direct selling of agr. goods, easements, condemnation, etc.).

Legal Land Descriptions

4. Conduct an interest approach and have the students develop a list of problems and concerns related to legal land descriptions.

5. Have the students complete Worksheet 1, "Legal Land Surveys," using VAS Unit 2042. Discuss the material covered in conjunction with appropriate transparencies.

6. Explain the relationship between counties, townships and sections through the use of transparencies.

7. Using transparencies discuss important information concerning townships. Ask students why townships are irregular. Explain by using appropriate transparency. At the close of discussion distribute Worksheet 2, "Townships" and have students complete the exercise.

8. Lead a class discussion on sections, their locations, size and composition utilizing transparency provided. Distribute Worksheet 3, "Sections" for the students to complete.

9. Assign each student a tract of land to utilize in completing Job Sheet 1. Those who have farmland may use their home farm.

10. Using Job Sheet 2, sharpen the students' land description skills by playing "Plat Book Bingo" or "Land Baron".

Ag Law

11. This section of the problem area can be presented utilizing two different methods. The instructor is encouraged to select the method from the following which is most appropriate to the specific class situation:
    A. Assign individuals or small groups each an area of VAS Unit 2018d "Law for the Farmer" to present to the class. Students may wish to use the worksheets and transparencies found in this problem area and local resource people as a guide for their discussion. Groups may present the material through a panel discussion. Teachers are encouraged to provide adequate guidance to the students in preparing the presentations. Proper public speaking skills should be encouraged.
    B. The instructor should conduct an interest approach, develop problems and concerns and utilize worksheets and transparencies concerning each of the chosen areas to be covered in this problem area.

12. Conduct a field trip lead by the county recorder, a local abstractor or title insurance agency to the county courthouse. Ask the tour guide to emphasize the areas handling legal documents and explain how the records are utilized. The following

class period review the field trip and discuss the different occupations viewed at the courthouse. The field trip may be developed as a part of the FFA chapter's American Heritage Program.

13. Invite resource people to speak to the class on agriculture topics of legal concern which have developed throughout the problem area. Example speakers might be a lawyer, an estate planner, the county assessor, an ASCS representative, a veterinarian, the game warden, etc. Have students ask questions they have accumulated on their list.

VII. Application:

1. Students may use knowledge learned from this problem area to better understand the legal procedures, rights, and responsibilities involved in ownership of their SOEP.

2. Students who become aware of legalities affecting agriculturalists are more able to protect themselves from possible legal problems in the future.

3. The knowledge and experience gained by FFA members can better enable them to conduct an American Heritage Program.

4. Students may use knowledge learned from this problem area in the farm business management contest.

VIII. Evaluation:

1. Administer and evaluate suggested worksheets in this instructional packet.

2. Evaluate students' performance on their class presentation of material.

3. Collect and grade Job Sheet 1.

4. Administer a paper and pencil test using the sample test questions as possible test items.

5. Evaluate students' participation on field trips and/or interaction with guest speakers.

References and aids:

The following materials are available from Vocational Agriculture Service, University of Illinois, Urbana, Illinois:
1. VAS Unit 2042, "Land Surveys and Descriptions"
2. VAS Unit 2018d, "Law for the Farmer"

Other recommended references

1. Cooperative Extension Service, University of Illinois
    - a. Circular 1079 "Law for the Illinois Farmer"
    - b. Circular 1199 "Farm Leases for Illinois"
    - c. Circular 823 "Installment Land Contracts for Farmland"
    - d. Circular 1164 "Illinois Wills, Joint Tenancy, Inheritance Tax, and Probate Procedure"
    - e. Circular 1062 "Inheritance and Gift Taxes on Illinois Farm Property"
    - f. Circular 1087 "Consumer Credit: Uses, Costs, Laws"
    - g. Circular 1139 "Agricultural Labor Laws in Illinois"
    - h. Circular 751 "Illinois Farm Drainage Law"
    - i. Circular 1211 "Illinois Fence Laws"
    - j. Circular 1202 "Illinois Easement Law"
    - k. Circular 1024 "Water in Illinois"
    - l. Circular 1130 "Pollution Laws and the Illinois Farmer"
    - m. Circular 974 "Condemnation: The Public Taking of Illinois Farm aLnd"
    - n. Circular 1195 "Direct Marketing by Farmers to Consumers"

    The preceding material may also be obtained from Vocational Agricultural Service, University of Illinois, Urbana, Illinois.

2. The Farm Management Guide - 15th Edition.
    Doane-Western, Inc.
    8900 Manchester Road
    St. Louis, Missouri 63144

3. Facts and Figures for Farmers
    Doane-Western, Inc.
    8900 Manchester Road
    St. Louis, Missouri 63144

COMPETENCY INVENTORY

AGRICULTURAL LAW

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

	Competency	Circle One						
1.	Describe the difference between the two major systems of land surveys and descriptions used in the United States.	1	2	3	4	5		
2.	Locate a given piece of property in a plat book using its rectangular survey legal descriptions.						6	7
3.	Describe the process for making a property transaction.	1	2	3	4	5		
4.	List the reasons for estate planning and providing a will.	1	2	3	4	5		
5.	Identify the legal rights and responsibilities of a property owner.	1	2	3	4	5		
6.	Analyze the types of rental agreements including the requirements which make them legally enforceable.	1	2	3	4	5		
7.	Compare the legal obligation of the landlord and the tenant.	1	2	3	4	5		
8.	Given a plat book and a tract of land describe the tract using the rectangular survey method.						6	7
9.	Outline the importance of utilizing legal land descriptions.	1	2	3	4	5		
10.	Outline the legal responsibility of an employer for farm laborers.	1	2	3	4	5		
11.	Explain the benefits of drainage districts.	1	2	3	4	5		
12.	Identify the legal responsibilities of landowner has for water on the property.	1	2	3	4	5		

Competency List (con't)		Circle One				
13.	Describe the extent of a farmer's responsibility for constructing and maintaining legal fences including division fences.	1	2	3	4	5
14.	Cite the criterion used to determine an animal owner's liability for damages due to roaming animals.	1	2	3	4	5
15.	List the animal diseases that are governed by law.	1	2	3	4	5
16.	Identify the legally required actions necessary for controlling disease.	1	2	3	4	5
17.	Analyze the reasons for and agricultural aspects of environmental protection.	1	2	3	4	5
18.	List the criterion used in selecting a lawyer.	1	2	3	4	5

______________________________ Name

______________________________ Date

STUDENT WORKSHEET #1

LEGAL LAND SURVEYS

(For use with VAS Unit 2042)

1. Why is it necessary to use legal land descriptions?

2. What is the metes and bounds system of describing land?

3. Why was the rectangular survey system established?

4. Who directed the organization of the original rectangular land survey?

5. Define the following terms:

   a. principal meridian

   b. base line

   c. survey township

   d. section

   e. standard parallels

   f. guide meridians

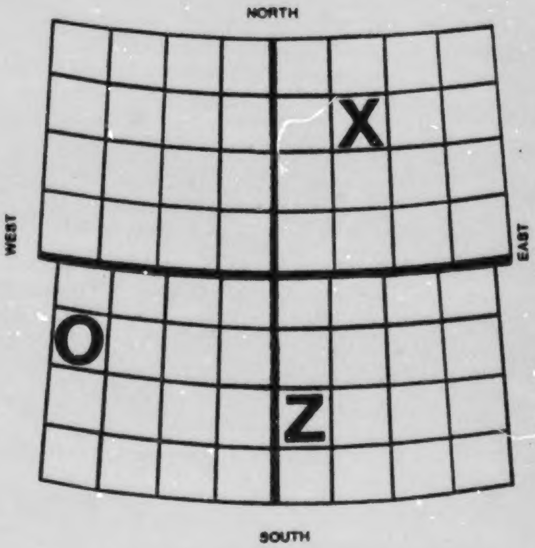
STUDENT WORKSHEET #2

TOWNSHIPS

(For use with VAS Unit 2042)

1. Using the letters corresponding to each description, label the diagram.

   a) Principal meridian
   b) Base line
   c) Township 1 north Range 3 east
   d) Township 3 south Range 2 west
   e) Township 4 north Range 1 west
   f) Township 2 south Range 4 east



2. Write the description for the tract of land represented by;

   X

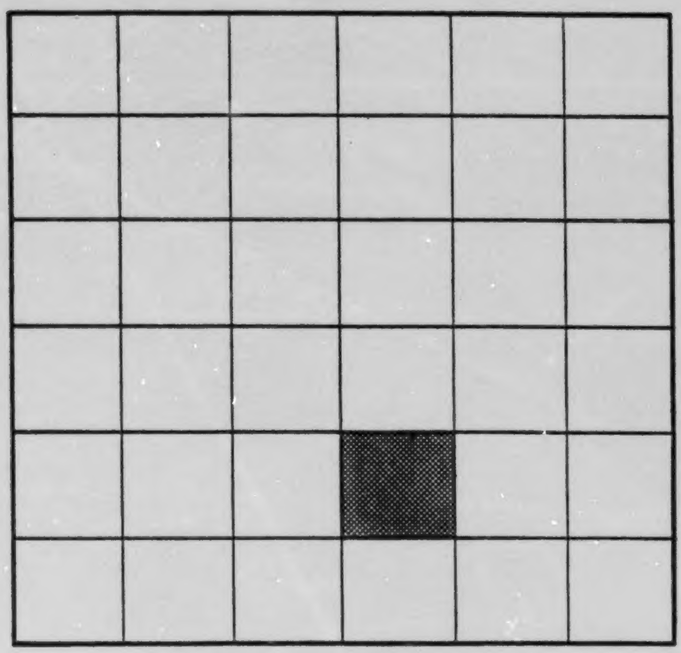
   O

   Z

3. How many square miles are there in a township?

4. Each township contains _____sections.

5. Number the sections shown in the enlarged map shown below of Township 3 north Range 2 east.



6. What number is the section that is shaded?

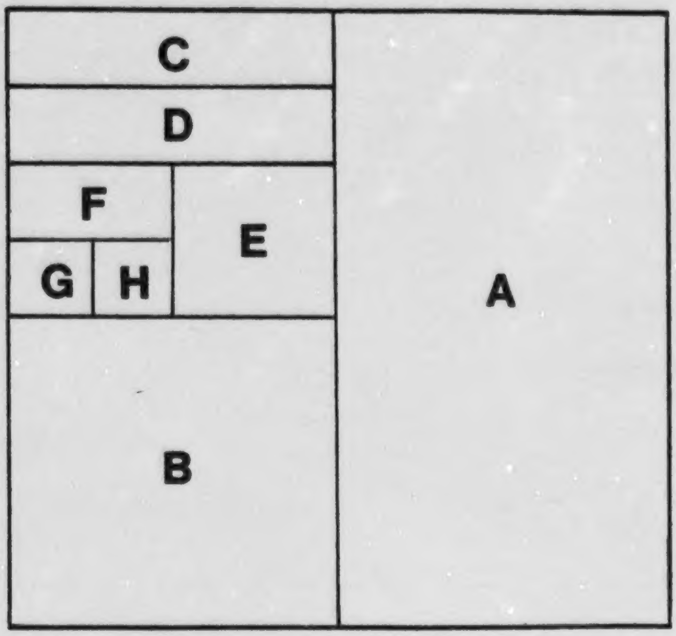
STUDENT WORKSHEET #3

SECTIONS

(For use with VAS Unit 2042)

1. A section measures _____ miles x _____ miles and contains _____ acres.

2. Write the number of acres and legal land description for each tract of land in the section represented by the following letters:
   A.
   B.
   C.
   D.
   E.
   F.
   G.
   H.



3. Locate and color in the tract of land in the section map described as N½ NE¼ SE¼

4. How many acres does question #3 describe?

STUDENT WORKSHEET #4

PROPERTY TRANSFER

(For use with VAS Unit 2018d, part 4)

1. List five sources of the laws affecting Illinois farmers.
    a.
    b.
    c.
    d.
    e.

2. Where might an agriculturalist go to get copies of or information on Illinois laws?
    a.
    b.
    c.
    d.
    e.

3. Define common law principles.

4. Explain the purpose of a warranty deed.

5. What are the two types of warranties (promises)?
    a.
    b.

6. When property ownership is transferred what warranties are implied?
    a.
    b.
    c.

7. ____________________deeds are used to clear titles to property.

8. Explain briefly what is meant by "clearing a title".

9. What is an abstract?

10. Who prepares abstracts?

11. What is the advantage of an abstract?

12. Define title insurance.

13. ________________ is a system of registering the actual title of land instead of the evidence of such title.

14. Which do you feel is the better system of handling land titles, the present recording system or the Torrens system? Why? (Explain your position.)

STUDENT WORKSHEET #5

THE RIGHTS AND RESPONSIBILITIES OF THE PROPERTY OWNER

(For use with VAS Unit 2018d, Part 1)

1. What is the basis for determining the amount of tax paid on property?
    a.
    b.
2. How are property taxes established in our county?
3. Who is our county assessor?
4. When was your property last assessed?

5. When and to whom do you pay property tax?

6. How is the landowner protected against unfair or excessive valuation of land?

7. Briefly explain what factors are considered in determining the per acre value of land for tax purposes.

8. How can disputes over property lines be legally settled?

9. Using the chart below list the rights and responsibilities of the landowner for each area.

Area	Rights	Responsibilities
Land Support		
Trespassing		
Hunting & Fishing		
Trees		

439

STUDENT WORKSHEET #6

WILL AND ESTATES

(For use with VAS Unit 2018d, Part 1)

1. Why is it important to have a will?

2. If there is not a will, property is distributed according to ________ ________________________________.

3. Explain the effect of inheritance laws and wills on the following items.
   a. Minimum spouse inheritance

   b. Joint-tenants with the Right-of-Survivorship

   c. Survivor's administration allowance

   d. Life insurance

   e. Briefly explain the difference between "guardian of the person" and a "guardian of the estate".

5. Define the following terms.
   a. Executor of a will

   b. Administrator of a will

6. What are the five formal requirements of an Illinois will?
   a.
   b.
   c.
   d.
   e.

8. Explain how to revoke a will.

9. When should a will be reviewed or revised?

10. Where should a will be kept?

11. Define the following terms.
    a. Estate

    b. Life tenants

12. What are the three types of taxes which affect estate planning?
    a.
    b.
    c.

13. What factors affect the rate of inheritance tax?
    a.
    b.

14. Why is estate planning important to a property owner?

15. When should estate planning be done?

STUDENT WORKSHEET #7

LANDLORD AND TENANT

(For use with VAS Unit 2018d, Part 2)

1. What are the five legal requirements of a written lease?
   a.
   b.
   c.
   d.
   e.

2. ___________________is a tenant that does not have a written lease. Because the agreement is oral it is difficult for this type of tenant to prove her/his rights.

3. When terminating a lease what is the period of notice that the tenant is entitled to in a:
   a. written lease

   b. year-to-year agreement

4. The best protection for a landlord and tenants is:

5. Material participation in the farming operation can affect the landlords;
   a. ________________________ tax,
   b. ________________________ benefits,
   c. ________________________ tax, and
   d. ________________________ tax.

6. List the three conditions that the tenant must meet to remove improvements made by the tenant from the land.
   a.
   b.
   c.

7. When is a structure considered removable?

8. What rights does a landlord have when a tenant abandons the property?

STUDENT WORKSHEET #8

FARM LABOR

(For use with VAS Unit 2018d, Part 3)

1. True or False A wage agreement which will last for less than a year can be oral and still be legally binding.

2. True or False A person hired at will is employed for a definite period of time.

3. True or False A person hired at will may resign or be discharged with no notice.

4. List the two means by which a farm employer's liability can be determined.
   a.
   b.

5. When are employers covered by the Workman's Compensation Act?

6. Compare common law and workman's compensation by completing the chart below.

Characteristic	Common Law	Workman's Compensation
Speed of Payment		
Liability		
Coverage		
Cost		

7. Are agriculture workers normally covered by the Federal Minimum Wage Law? Why or why not?

8. Do most farm laborers qualify for unemployment insurance? Why or why not?

9. Under what conditions is agriculture employment subject to the unemployment compensation act?

   a.

   b.

STUDENT WORKSHEET #9

DRAINAGE AND WATER RIGHTS

(For use with VAS Unit 2018d, Part 4)

1. What provisions must be made if a landowner alters the flow of drainage across his/her land?
   a.
   b.

2. What are the local drainage districts?

3. When were the local districts established?

4. What benefits have been brought about by our drainage district?

5. According to the common laws on damming or impounding water what are the responsibilities of the landowner concerning the construction of a dam?
   a.
   b.
   c.
   d.
   e.

6. What are the responsibilities of the landowner for ground water?
   a.
   b.
   c.

STUDENT WORKSHEET #10

FENCES

(For use with VAS Unit 2018d, Part 5)

1. Define a legal fence.

2. What materials could be used to build a fence?

3. Who determines what constitutes a legal fence in our county?

4. What constitutes a legal fence in our county?

5. When can an owner of an electric fence be held liable for injury caused by the fence?

6. According to Illinois law who is responsible for a division fence?

7. Who decides which portion of the fence each neighbor is responsible for?

8. Under what conditions is a landowner not responsible for his/her share of a division fence?

STUDENT WORKSHEET #11

LIVESTOCK

(For use with VAS Unit 2018d, Part 6)

1. Your neighbor's cow breaks out of the fence into your newly sodden lawn. What factors must be considered in determining who is liable for damages?
   a.
   b.
   c.
   d.

2. What should your neighbor do to minimize the damage?

3. You find an estray on your land. What could it be?

4. You would like to keep the estray goat, what can you do to legally claim the animal?
   a.
   b.
   c.

5. How would this procedure change if the estray animal were a cow?

6. What would happen if the goat's owner came to retrieve the animal after 2 months had passed since you found the estray?

7. The general rules governing animals loose on a road or highway follows the same basic principles as those covering trespassing animals. In addition to these general rules what does the law demand that a farmer do if he/she drive animals along or across the roadway.

8. Are you required to license a dog where you live? If "yes" how can this be done?

9. Under what circumstances may you kill a dog?

10. When is the injured person held responsible for a dog's attack?
    a.
    b.
    c.

11. The owner is responsible for damages done by a vicious animal only if the animal ____.

STUDENT WORKSHEET #12

ANIMAL DISEASE LAWS

Complete the chart using the information found in VAS Unit 2018d Part 7

Disease	Control Measures	Treatment and Disposal
Rabies		
Hog Cholera		
Brucellosis		
Tuberculosis		

STUDENT WORKSHEET #13

ENVIRONMENTAL PROTECTION

(For use with VAS Unit 2018d, Part 8)

1. Briefly explain the purpose of the Environmental Protection Act.

2. Why is our environment important?

3. In your opinion, why has it become necessary for the government to establish environmental protection laws?

4. Who enforces environmental protection laws in this area?

5. As an agriculturalist what can you do to protect our environment?

6. Who is required to have a custom chemical applicator's license? Do you think this should be necessary?

7. How can you acquire an applicator's license in your area? (Where would you go, what would you need to do?)

8. As businesses are required to meet pollution control regulation the cost of manufacturing their product is increased. Who pays for pollution control? Who financially supports the various pollution control/environmental protection agencies? How do you feel about this? Why?

JOB SHEET #1

USING COUNTY PLAT BOOKS

Objectives:

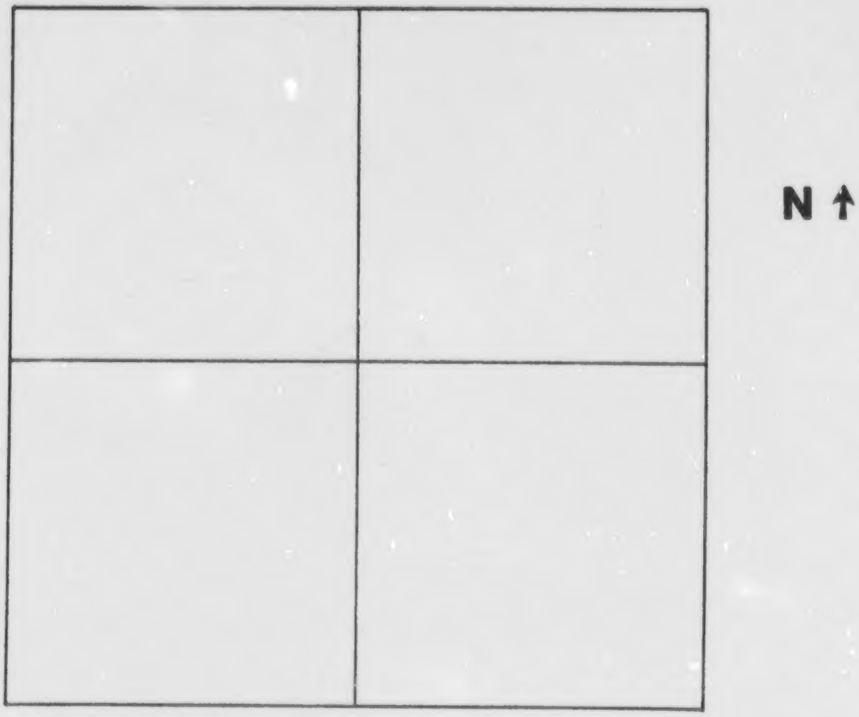
1. To familiarize students with the information contained in plat books.
2. To develop the student's ability to locate specified land areas by using county plat books.

Materials:

1. Multiple copies of county plat books.
2. Legal descriptions of identified land areas.

Procedure:

Using a county plat book locate the property owned by ____________. In the space provided below sketch the property and record the legal land description. Scale: 2 inch = 1 mile



Legal land description: ____

____

JOB SHEET #2

LAND DESCRIPTIONS

Objectives:

1. To be able to locate property in a plat book by the property's rectangular land description.
2. To be able to properly describe a given tract of land using the rectangular survey system.

Materials:

1. Game markers: chips, corn seed, pennies, lightly shade with pencil
2. Game cards: The township map #2 provided in this problem area can be used to make 16 game cards. The instructor will need to make 9 copies of the map. Cut the maps into cards following the dotted lines in the diagrams.

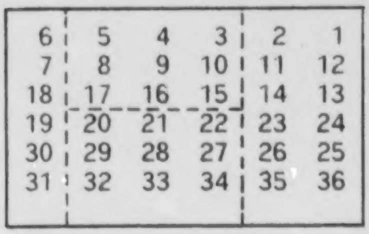
   For classes needing more than 16 cards the instructor should develop additional cards by altering the sequence of the section on the playing cards.

3. Description slips: Duplicate the Teacher's Key to Job Sheet 2 and cut the answers into individual slips of paper. Place in a container.

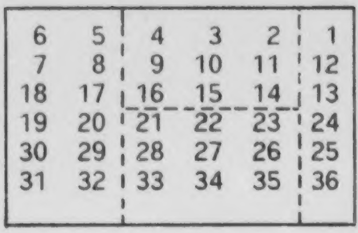
Procedures:

A. Plat Book Bingo - Method 1
Cards are made from map #2. The instructor draws an answer from the description slip container and calls out the number of the tract of land. Example - 4. W½ of NE¼ of Section 2 80 acres - the instructor would call out the number "4". The students mark their cards accordingly. The student yells "Bingo" when s/he has marked a tract of land in each of three diagonally connecting sections or each of the four corner sections on the playing card. To win the student must be able to properly write the legal descriptions of the 3 or 4 tracts of land that entitle him/her to "Bingo".

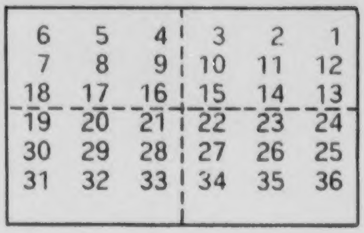
B. Plat Book Bingo - Method 2
Cards are made from map #2. This game follows the same directions as Plat Book Bingo - Method 1 with the following alterations. When the instructor draws a description slip s/he reads off the legal land description only. Repeat the description 3 times slowly or write the description on the blackboard. Example - 4. W½ of NE¼ of Section 2 80 acres - the instructor would read or write - "W½ of NE¼ of Section 2". To check the student's "Bingo" they must list the numbers of the tracts of land. Example - 4; 49; 89.


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

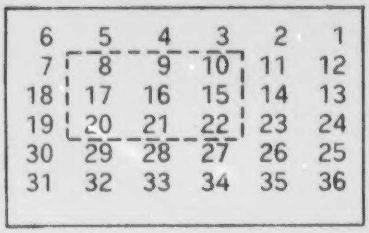
2 cards


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

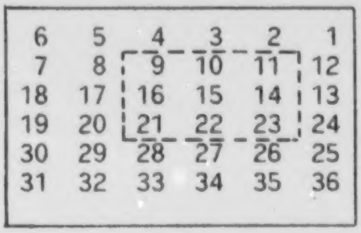
2 cards


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

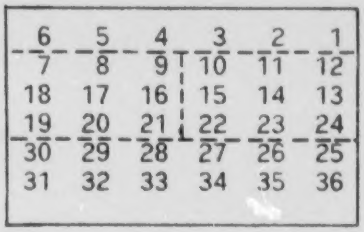
4 cards


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

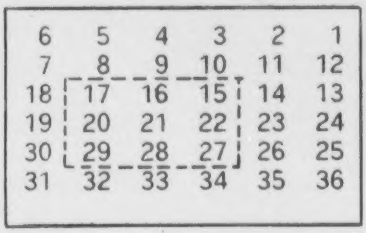
1 card


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

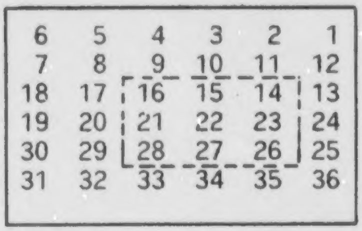
1 card


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

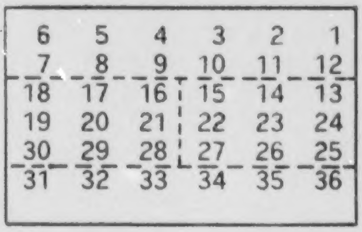
2 cards


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

1 card


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

1 card


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

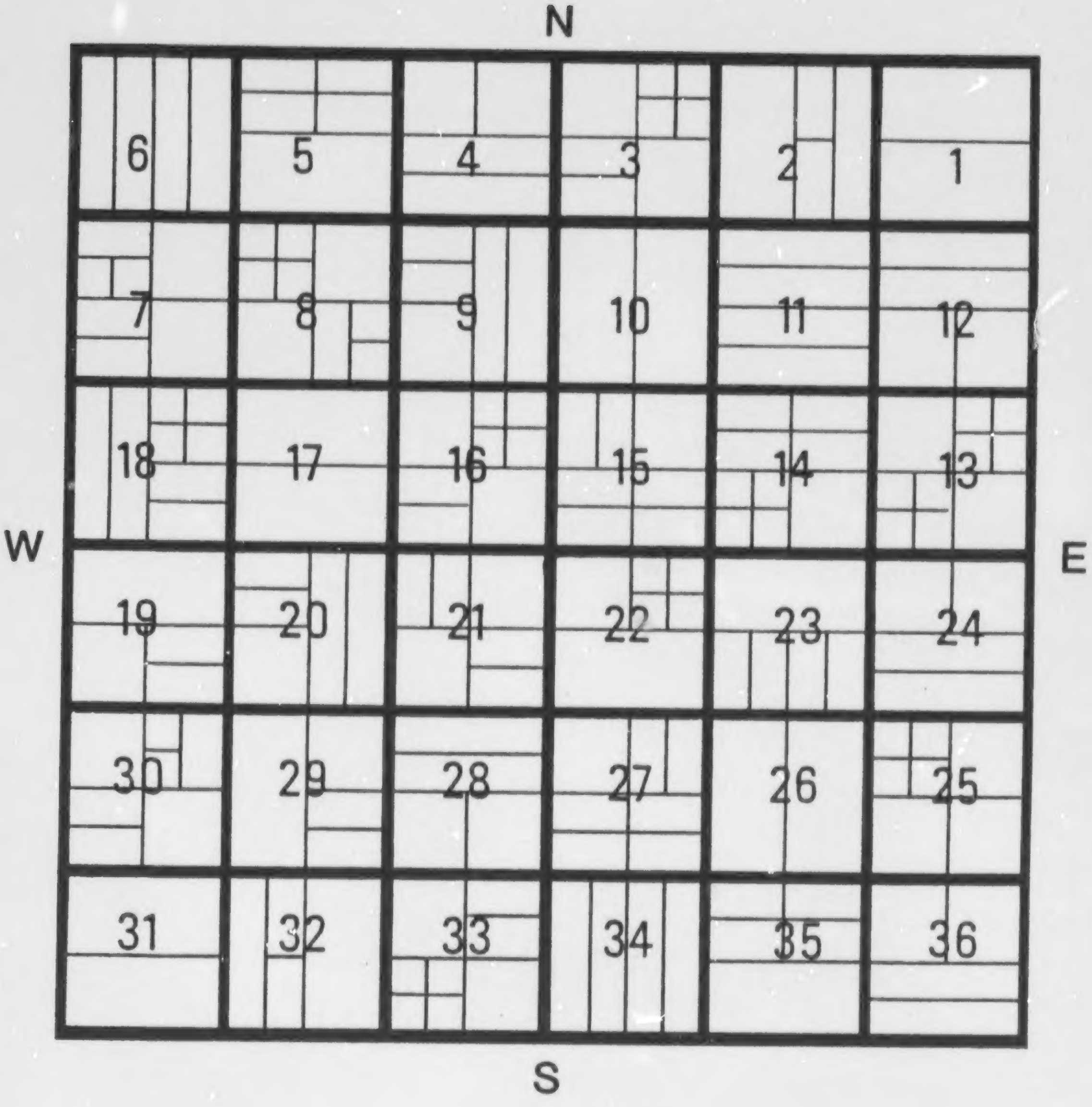
2 cards

C. Land Baron

Cards are made from Map #2. The instructor draws description slips and reports the land tract number to the class as in Plat Book Bingo - Method 1. After each number is called allow students time to mark their cards and list on a sheet of paper its legal description and acreage. To win students must mark (own) 1500 acres on their playing card and properly identify the land by its legal land description and acreage.

D. Map #1 can be used by the instructor as a quiz and/or worksheet by selecting tracts of land for the student to identify.

MAP #1


N
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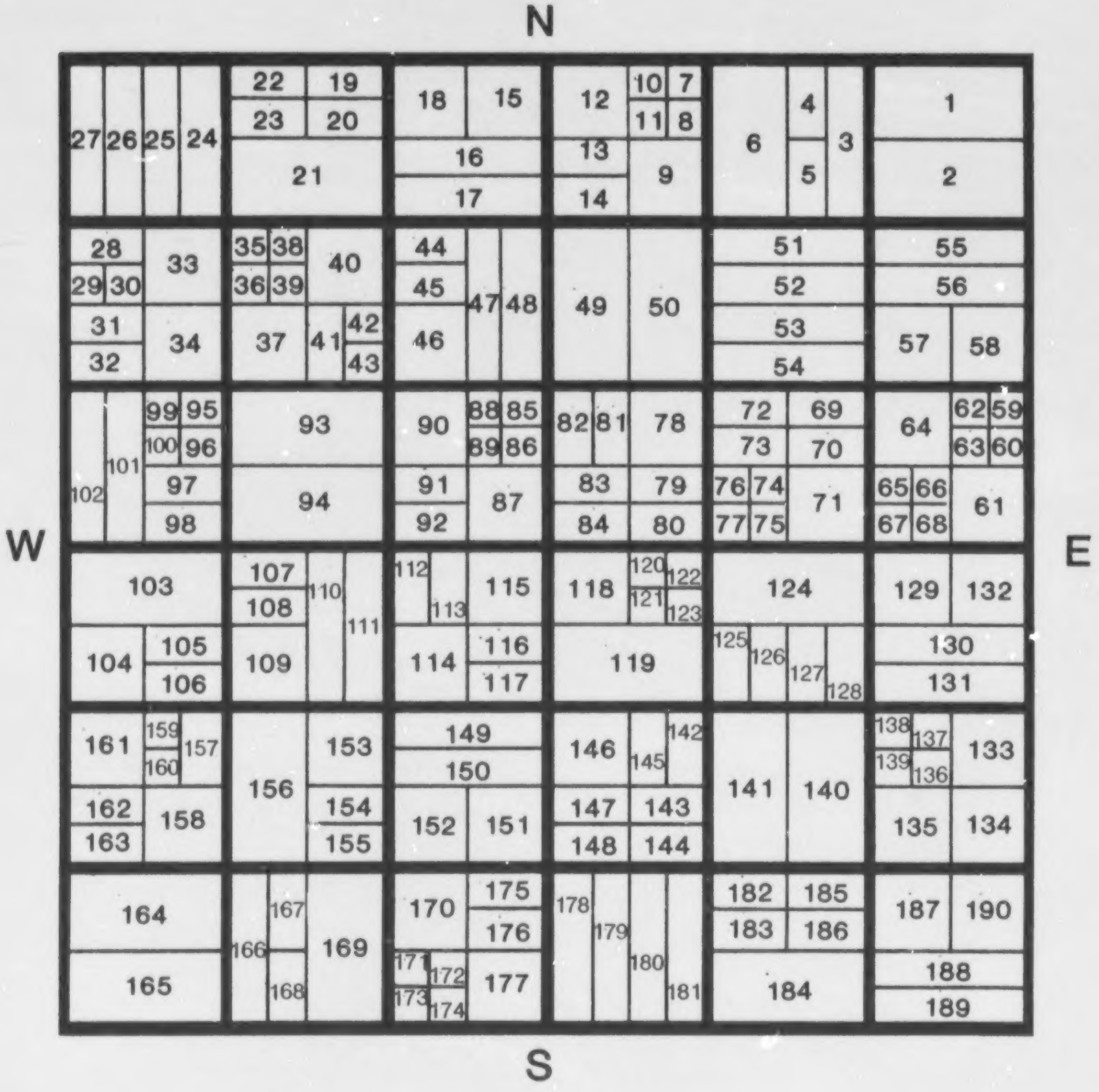
MAP #2



IV-I-7-39

JOB SHEET #2

ANSWER KEY TO TOWNSHIP MAP

1.	N.½ of Section 1	320 ac
2.	S.½ of Section 1	320 ac
3.	E.½ of E.½ of Section 2	160 ac
4.	W.½ of N.E.¼ of Section 2	80 ac
5.	W.½ of S.E.¼ of Section 2	80 ac
6.	W.½ of Section 2	320 ac
7.	N.E.¼ of N.E.¼ of Section 3	40 ac
8.	S.E.¼ of N.E.¼ of Section 3	40 ac
9.	S.E.¼ of Section 3	160 ac
10.	N.W.¼ of N.E.¼ of Section 3	40 ac
11.	S.W.¼ of N.E.¼ of Section 3	40 ac
12.	N.W.¼ of Section 3	160 ac
13.	N.½ of S.W.¼ of Section 3	80 ac
14.	S.½ of S.W.¼ of Section 3	80 ac
15.	N.W.¼ of Section 4	160 ac
16.	N.½ of S.½ of Section 4	160 ac
17.	S.½ of S.½ of Section 4	160 ac
18.	N.W.¼ of Section 4	160 ac
19.	N.½ of N.E.¼ of Section 5	80 ac
20.	S.½ of N.E.¼ of Section 5	80 ac
21.	S.½ of Section 5	320 ac
22.	N.½ of N.W.¼ of Section 5	80 ac
23.	S.½ of N.W.¼ of Section 5	80 ac
24.	E.½ of E.½ of Section 6	160 ac
25.	W.½ of E.½ of Section 6	160 ac
26.	E.½ of W.½ of Section 6	160 ac
27.	W.½ of W.½ of Section 6	160 ac
28.	N.½ of N.W.¼ of Section 7	80 ac
29.	S.W.¼ of N.W.¼ of Section 7	40 ac
30.	S.E.¼ of N.W.¼ of Section 7	40 ac
31.	N.½ of S.W.¼ of Section 7	80 ac
32.	S.½ of S.W.¼ of Section 7	80 ac
33.	N.E.¼ of Section 7	160 ac
34.	S.E.¼ of Section 7	160 ac
35.	N.W.¼ of N.W.¼ of Section 8	40 ac
36.	S.W.¼ of N.W.¼ of Section 8	40 ac
37.	S.W.¼ of Section 8	160 ac
38.	N.E.¼ of N.W.¼ of Section 8	40 ac
39.	S.E.¼ of N.W.¼ of Section 8	40 ac
40.	N.E.¼ of Section 8	160 ac
41.	W.½ of S.E.¼ of Section 8	80 ac
42.	N.E.¼ of S.E.¼ of Section 8	40 ac
43.	S.W.¼ of S.E.¼ of Section 8	40 ac
44.	N.½ of N.W.¼ of Section 9	80 ac
45.	S.½ of N.W.¼ of Section 9	80 ac
46.	S.W.¼ of Section 9	160 ac
47.	W.½ of E.½ of Section 9	160 ac
48.	E.½ of E.½ of Section 9	160 ac
49.	W.½ of Section 10	320 ac
50.	E.½ of Section 10	320 ac

51.	N.½ of N.½ of Section 11	160 ac
52.	S.½ of N.½ of Section 11	160 ac
53.	N.½ of S.½ of Section 11	160 ac
54.	S.½ of S.½ of Section 11	160 ac
55.	N.½ of N.½ of Section 12	160 ac
56.	S.½ of N.½ of Section 12	160 ac
57.	S.W.¼ of Section 12	160 ac
58.	S.E.¼ of Section 12	160 ac
59.	N.E.¼ of N.E.¼ of Section 13	40 ac
60.	S.E.¼ of N.E.¼ of Section 13	40 ac
61.	S.E.¼ of Section 13	160 ac
62.	N.W.¼ of N.E.¼ of Section 13	40 ac
63.	S.W.¼ of N.E.¼ of Section 13	40 ac
64.	N.W.¼ of Section 13	160 ac
65.	N.W.¼ of S.W.¼ of Section 13	40 ac
66.	N.E.¼ of S.W.¼ of Section 13	40 ac
67.	S.W.¼ of S.W.¼ of Section 13	40 ac
68.	S.E.¼ of S.W.¼ of Section 13	40 ac
69.	N.½ of N.E.¼ of Section 14	80 ac
70.	S.½ of N.E.¼ of Section 14	80 ac
71.	S.E.¼ of Section 14	160 ac
72.	N.½ of N.W.¼ of Section 14	80 ac
73.	S.½ of N.W.¼ of Section 14	80 ac
74.	N.E.¼ of S.W.¼ of Section 14	40 ac
75.	S.E.¼ of S.W.¼ of Section 14	40 ac
76.	N.W.¼ of S.W.¼ of Section 14	40 ac
77.	S.W.¼ of S.W.¼ of Section 14	40 ac
78.	N.E.¼ of Section 15	160 ac
79.	N.½ of S.E.¼ of Section 15	80 ac
80.	S.½ of S.E.¼ of Section 15	80 ac
81.	E.½ of N.W.¼ of Section 15	80 ac
82.	W.½ of N.W.¼ of Section 15	80 ac
83.	N.½ of S.W.¼ of Section 15	80 ac
84.	S.½ of S.W.¼ of Section 15	80 ac
85.	N.E.¼ of N.E.¼ of Section 16	40 ac
86.	S.E.¼ of N.E.¼ of Section 16	40 ac
87.	S.E.¼ of Section 16	80 ac
88.	N.W.¼ of N.E.¼ of Section 16	40 ac
89.	S.W.¼ of N.E.¼ of Section 16	40 ac
90.	N.W.¼ of Section 16	160 ac
91.	N.½ of S.W.¼ of Section 16	80 ac
92.	S½ of S.W.¼ of Section 16	80 ac
93.	N.½ of Section 17	320 ac
94.	S.½ of Section 17	320 ac
95.	N.E.¼ of N.E.¼ of Section 18	40 ac
96.	S.E.¼ of N.E.¼ of Section 18	40 ac
97.	N.½ of S.E.¼ of Section 18	80 ac
98.	S.½ of S.E.¼ of Section 18	80 ac
99.	N.W.¼ of N.E.¼ of Section 18	40 ac
100.	S.W.¼ of N.E.¼ of Section 18	40 ac
101.	E.½ of W.½ of Section 18	160 ac
102.	W.½ of W.½ of Section 18	160 ac
103.	N.½ of Section 19	320 ac
104.	S.W.¼ of Section 19	160 ac

105. N.½ of S.E.¼ of Section 19	80 ac
106. S.½ of S.E.¼ of Section 19	80 ac
107. N.½ of N.W.¼ of Section 20	80 ac
108. S.½ of N.E.¼ of Section 20	80 ac
109. S.W.¼ of Section 20	160 ac
110. W.½ of E.½ of Section 20	160 ac
111. E.½ of E.½ of Section 20	160 ac
112. W.½ of N.W.¼ of Section 21	80 ac
113. E.½ of N.W.¼ of Section 21	80 ac
114. S.W.¼ of Section 21	160 ac
115. N.E.¼ of Section 21	80 ac
116. N.½ of S.E.¼ of Section 21	80 ac
117. S.½ of S.E.¼ of Section 21	80 ac
118. N.W.¼ of Section 22	160 ac
119. S.½ of Section 22	320 ac
120. N.W.¼ of N.E.¼ of Section 22	40 ac
121. S.W.¼ of N.E.¼ of Section 22	40 ac
122. N.E.¼ of N.E.¼ of Section 22	40 ac
123. S.E.¼ of N.E.¼ of Section 22	40 ac
124. N.½ of Section 23	320 ac
125. W.½ of S.W.¼ of Section 23	80 ac
126. E.½ of S.W.¼ of Section 23	80 ac
127. W.½ of S.E.¼ of Section 23	80 ac
128. E.½ of S.E.¼ of Section 23	160 ac
129. N.W.¼ of Section 24	160 ac
130. N.½ of S.½ of Section 24	160 ac
131. S.½ of S.½ of Section 24	160 ac
132. N.E.¼ of Section 24	160 ac
133. N.E.¼ of Section 25	160 ac
134. S.E.¼ of Section 25	160 ac
135. S.W.¼ of Section 25	160 ac
136. S.E.¼ of N.E.¼ of Section 25	40 ac
137. N.E.¼ of N.W.¼ of Section 25	40 ac
138. N.W.¼ of N.W.¼ of Section 25	40 ac
139. S.W.¼ of N.W.¼ of Section 25	40 ac
140. E.½ of Section 26	320 ac
141. W.½ of Section 26	320 ac
142. E.½ of N.E.¼ of Section 27	80 ac
143. N.½ of S.E.¼ of Section 27	80 ac
144. S.½ of S.E.¼ of Section 27	80 ac
145. W.½ of N.E.¼ of Section 27	80 ac
146. N.W.¼ of Section 27	160 ac
147. N.½ of S.W.¼ of Section 27	80 ac
148. S.½ of S.W.¼ of Section 27	80 ac
149. N.½ of N.½ of Section 28	160 ac
150. S.½ of N.½ of Section 28	160 ac
151. S.E.¼ of Section 28	160 ac
152. S.W.¼ of Section 28	160 ac
153. N.E.¼ of Section 29	160 ac
154. N.½ of S.E.¼ of Section 29	80 ac
155. S.½ of S.E.¼ of Section 29	80 ac
156. W.½ of Section 29	320 ac
157. E.½ of N.E.¼ of Section 30	80 ac
158. S.E.¼ of Section 30	160 ac

159. N.W.¼ of N.E.¼ of Section 30	40 ac
160. S.W.¼ of N.E.¼ of Section 30	40 ac
161. N.W.¼ of Section 30	160 ac
162. N.½ of S.W.¼ of Section 30	80 ac
163. S.½ of S.W.¼ of Section 30	80 ac
164. N.½ of Section 31	320 ac
165. S.½ of Section 31	320 ac
166. W.½ of W.½ of Section 32	160 ac
167. E.½ of N.W.¼ of Section 32	80 ac
168. E.½ of S.W.¼ of Section 32	80 ac
169. E.½ of Section 32	320 ac
170. N.W.¼ of Section 33	160 ac
171. N.W.¼ of S.W.¼ of Section 33	40 ac
172. N.E.¼ of S.W.¼ of Section 33	40 ac
173. S.W.¼ of S.W.¼ of Section 33	40 ac
174. S.E.¼ of S.W.¼ of Section 33	40 ac
175. N.½ of N.E.¼ of Section 33	80 ac
176. S.½ of N.E.¼ of Section 33	80 ac
177. S.E.¼ of Section 33	160 ac
178. W.½ of W.½ of Section 34	160 ac
179. E.½ of W.½ of Section 34	160 ac
180. W.½ of E.½ of Section 34	160 ac
181. E.½ of E.½ of Section 34	160 ac
182. N.½ of N.W.¼ of Section 35	80 ac
183. S.½ of N.W.¼ of Section 35	80 ac
184. S.½ of Section 35	320 ac
185. N.½ of N.E.¼ of Section 35	80 ac
186. S.½ of N.E.¼ of Section 35	80 ac
187. N.W.¼ of Section 36	160 ac
188. N.½ of S.½ of Section 36	160 ac
189. S.½ of S.½ of Section 36	160 ac
190. N.E.¼ of Section 36	160 ac

TEACHER'S KEY

WORKSHEET #1

LEGAL LAND SURVEYS

(For use with VAS Unit 2042)

1. Why is it necessary to use legal land descriptions?
   To provide a method by which a person can obtain a clear title to any tract of land

2. What is the metes and bounds system of describing land?
   A land description method that starts with a "point of beginning" and outlines the tract using north and south directionals, measurements and reference points such as rocks, rivers, trees, stakes and fences.

3. Why was the rectangular survey system established?
   To provide corner markers on the ground that would be permanent and to provide short, complete, direct and easily understood legal description

4. Who directed the organization of the original rectangular land survey?
   Thomas Jefferson in 1785

5. Define the following terms:

   a. Principal meridian - Lines running north and south established by the original rectangular surveyors from which measurements are made going east or west. These are not connected in any way to the global geographic meridians.

   b. Base line - Lines running east and west established by the original rectangular surveyors from which measurements are made going north and south.

   c. Survey township - A 36 sq. mile area of land measuring 6 miles x 6 miles. A township is located by its relationship from a meridian and a baseline in terms of tiers and ranges. A survey township is not necessarily the same as a governmental township.

   d. Section - A 1 mile x 1 mile area of land located in township by a specified numbering system. Each section contains 640 acres.

   e. Standard parallels - Correction lines made every 24 miles north and south from a base line.

   f. Guide meridians - Correction lines made every 24 miles east and west from a principal meridian.

TEACHER'S KEY

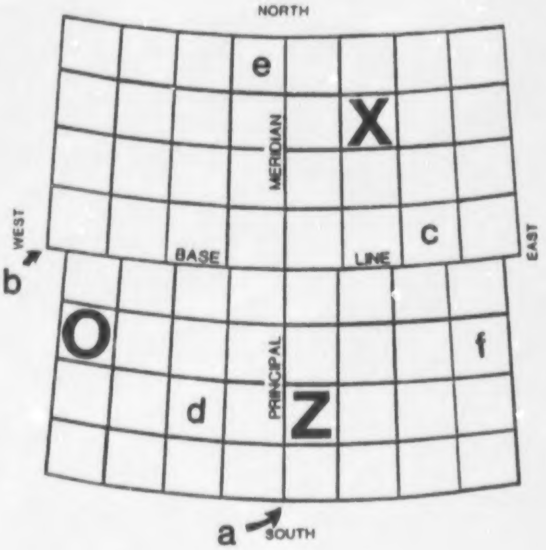
WORKSHEET #2

TOWNSHIPS

(For use with VAS Unit 2042)

1. Using the letters corresponding to each description, label the diagram.

   a) Principal meridian
   b) Base line
   c) Township 1 north Range 3 east
   d) Township 3 south Range 2 west
   e) Township 4 north Range 1 west
   f) Township 2 south Range 4 east


NORTH
e
X
MERIDIAN
WEST
b
BASE
LINE
c
EAST
O
f
d
PRINCIPAL
Z
a
SOUTH

2. Write the description for the tract of land represented by;
   X Township 3 north Range 2 east
   O Township 2 south Range 4 west
   Z Township 3 south Range 1 east

3. How many square miles are there in a township? 36

4. Each township contains 36 sections.

5. Number the sections shown in the enlarged map shown below of Township 3 north Range 2 east.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

6. What number is the section that is shaded? 27

TEACHER'S KEY

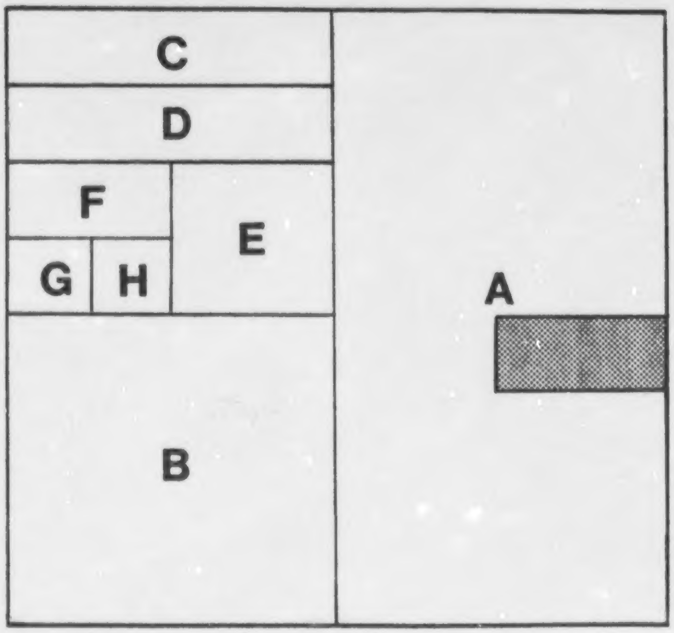
WORKSHEET #3

SECTIONS

(For use with VAS Unit 2042)

1. A section measures 1 miles × 1 miles and contains 640 acres.

2. Write the number of acres and legal land description for each tract of land in the section represented by the following letters:
   A. E½ 320 acres
   B. SW¼ 160 acres
   C. N½ N½ NW¼ 40 acres
   D. S½ N½ NW¼ 40 acres
   E. SE¼ NW¼ 40 acres
   F. N½ SW¼ NW¼ 20 acres
   G. SW¼ SW¼ NW¼ 10 acres
   H. SE¼ SW¼ NW¼ 10 acres



3. Locate and color in the tract of land in the section map described as N½ NE¼ SE¼

4. How many acres does question #3 describe? 20 acres

TEACHER'S KEY

WORKSHEET #4

PROPERTY TRANSFER

(For use with VAS Unit 2018d, part 4)

1. List five sources of the laws affecting Illinois farmers.
   a. Federal & State Constitutions
   b. Acts of Congress
   c. Statutes of Illinois
   d. Common Law
   e. Administrative regulations of federal and state agencies

2. Where might an agriculturalist go to get copies of or information on Illinois laws?
   a. Secretary of State
   b. Illinois revised statutes
   c. Federal or state agencies or their local offices
   d. Extension Advisor or College of Agriculture, State University
   e. Lawyer

3. Define common law principles.

   Those laws that result from previous court decisions.

4. Explain the purpose of a warranty deed.

   to guarantee a perfect title

5. What are the two types of warranties (promises)?
   a. expressed
   b. implied

6. When property ownership is transferred what warranties are implied?
   a. The estate of the seller is free of legal claims and the seller has the right to transfer the property.
   b. The property is free of any claims or liens.
   c. The owner may have peaceable possession and the seller will defend this right.

7. Quitclaim deeds are used to clear titles to property.

8. Explain briefly what is meant by "clearing a title".

   Anyone having interest in the property relinquishes that interest.

9. What is an abstract?

   The complete list of important information of the transfer and encumbrances affecting the property. A history of any legal actions pertaining to the property in chronological order.

10. Who prepares abstracts?

the county recorder or a private company

11. What is the advantage of an abstract?

It shows any weakness in the title and gives the buyer a chance to have the title cleared before the purchase.

12. Define title insurance.

An insurance policy that provides the purchaser of real estate with security against any imperfections in the title that may appear later.

13. Torrens system is a system of registering the actual title of land instead of the evidence of such title.

14. Which do you feel is the better system of handling land titles, the present recording system or the Torrens system? Why? (Explain your position.)

TEACHER'S KEY

WORKSHEET #5

THE RIGHTS AND RESPONSIBILITIES OF THE PROPERTY OWNER

(For use with VAS Unit 2018d, Part 1)

1. What is the basis for determining the amount of tax paid on property?

   a. the assessed valuation of the property

   b. the rate (percent) of the tax levy

2. How are property taxes established in our county?

3. Who is our county assessor?

4. When was your property last assessed?

5. When and to whom to you pay property tax?

6. How is the landowner protected against unfair or excessive valuation of land?

   Assessments are reviewed by the supervisor of assessments and then by the County Board of Review. Taxpayers may appeal the decision of the Board of Review or appeal to the courts for relief. Under Illinois Revised Statutes a landowner may also have the farmland valued twice - once at 33 1/3% of the fair cash value if sold for farming or agricultural purposes and once at 33 1/3% of the fair cash value of the property if sold for non-agricultural purposes. The owner is then taxed for the lower of the two valuations as long as the property is used for agricultural purposes.

7. Briefly explain what factors are considered in determining the per acre value of land for tax purposes.

   A formula is used to determine the value of the highest grade land in the state which takes into account the value per acre of agriculture products sold, value per acre of principal crops and the per acre sale price of land. All other farmland valuation is adjusted according to its productivity and actual use.

8. How can disputes over property lines be legally settled?

   The two property owners enter a written agreement to employ and abide by the survey of a specified surveyor.

9. Using the chart below list the rights and responsibilities of the landowner for each area.

Area	Rights	Responsibilities
Land Support	- to receive subjacent support for land where excavation endangers the land	- to provide lateral support to adjoining property when excavating near someone's property line
Trespassing	- to forbid entry by other persons to your property	- must post notice of forbidden entry conspicuously at the main entry to land or notify the person orally or in writing
Hunting & Fishing	- the occupants of the land (only those actually living on the land) have the right to hunt and fish on the property without a license (however it is best to check with the local game warden) - to destroy wild birds or animals other than game birds, when such wild animal or wild bird is destroying property by obtaining written permission from the Dept. of Conservation	- to hunt and fish only game which is legally in season and within legal limits - to obtain written permission before killing wild animals or birds from the Dept. of Conservation
Trees	- to half the tree growing on a property line - to trim branches overhanging your property line from a neighbor's tree - to all fruit produced by a tree growing on your property but overhanging onto another's property	- to prevent trees from obstructing highways or drainage ways - to protect trees used as boundary markers

TEACHER'S KEY

WORKSHEET #6

WILLS AND ESTATES

(For use with VAS Unit 2018d, Part 1)

1. Why is it important to have a will?
   A will enables decedents to distribute their property as they see fit (within limitation) and to appoint a guardian for dependent children and an executor to the will.

2. If there is not a will, property is distributed according to the Illinois interstate succession laws.

3. Explain the effect of inheritance laws and wills on the following items:
   a. Minimum spouse inheritance
      The will must provide a minimum of 1/3 of the estate to the surviving spouse. If the minimum 1/3 is not provided by the will the spouse can renounce the will and receive half of the estate.
   b. Joint-tenants with the Right-of-Survivorship
      The property passes automatically to the surviving joint tenant and does not pass through the will.
   c. Survivor's administration allowance
      This allowance enables the surviving spouse and dependent children to have financial support from the estate during the administration of the will.
   d. Life insurance
      If life insurance is payable to someone other than the estate the insurance passes directly to the person named and is not part of the estate.
   e. Briefly explain the difference between "guardian of the person" and a "guardian of the estate".
      The guardian of a person is responsibie for the custody and education of the minor while the guardian of the estate is responsible for the financial management of the minor's estate.

5. Define the following terms:
   a. Executor of a will
      The person chosen by the maker of the will to carry out the directions of the will during the period of administration with legal assistance.
   b. Administrator of a will
      The person chosen by the Circuit Court to handle the estate during the period of administration with legal assistance.

6. What are the five formal requirements of an Illinois will?
   a. the person must be of sound mind
   b. the person must be 18 years of age or older
   c. signed by the maker

   d. in writing
   e. witnessed by at least 2 persons

8. Explain how to revoke a will.
   A will can be terminated by physically destroying it, writing a new will or writing a statement revoking the will.

9. When should a will be reviewed or revised?
   A will should be reviewed every three years and when important changes take place in the person's life. Revisions should be made when necessary.

10. Where should a will be kept?
    One copy should be kept at home for reviewing and the signed copy kept in a safety deposit box.

11. Define the following terms.
    a. Estate
       The land or other property of a deceased owner.
    b. Life tenants
       A person given use of property by the owner for the lifetime of the tenant. They have all the rights of an owner except they cannot mortgage or sell the land. Upon the death of the tenant the land is passed on to the remainderman or reversioners.

12. What are the three types of taxes which affect estate planning?
    a. Illinois inheritance tax
    b. federal estate tax
    c. federal gift tax

13. What factors affect the rate of inheritance tax?
    a. the relationship of the beneficiary to the decedent
    b. the size of the inheritance

14. Why is estate planning important to a property owner?
    Estate planning can reduce the burden of taxation for the heirs. When the estate lacks liquidity it is difficult for the beneficiaries to obtain adequate cash to pay the estate taxes and other costs occurring at the time of death including the expense of any last medical costs, funeral expenses, administrational costs and attorney's fees.

    Estate planning can also provide the most personally appealing solutions for distributing limited assets among the heirs. It also helps to provide security for the parent's life.

15. When should estate planning be done?
    Estate planning should start when a person begins to acquire significant assets and reviewed periodically.

TEACHER'S KEY

WORKSHEET #7

LANDLORD AND TENANT

(For use with VAS Unit 2018d, Part 2)

1. What are the five legal requirements of a written lease?
   a. It must be signed by both parties.
   b. It must specify a definite time period for the property to be leased.
   c. It must contain a description of the property.
   d. It must name a specific lessor and lessee.
   e. It must provide for payment of rent.

2. A year-to-year tenant is a tenant that does not have a written lease. Because the agreement is oral it is difficult for this type of tenant to prove her/his rights.

3. When terminating a lease what is the period of notice that the tenant is entitled to in a:
   a. written lease
      the period specified in the lease
   b. year-to-year agreement
      4 months

4. The best protection for a landlord and tenants is a good written lease covering the essential points in the farm operation and a long enough period of notice.

5. Material participation in the farming operation can affect the landlords;
   a. self-employment tax,
   b. social security benefits,
   c. federal estate tax, and
   d. Illinois inheritance tax

6. List the three conditions that the tenant must meet to remove improvements made by the tenant from the land.
   a. He/she must not owe back rent to the landlord.
   b. He/she must have added the improvement to the property.
   c. The tenant must remove them before the term expires.

7. When is a structure considered removable?
   A fixture is removable when the parties intended it to be and when it can be removed with undue injury to the land or other building.

8. What rights does a landlord have when a tenant abandons the property?
   He/she may seize mature and harvested crops to pay for damages, rent and expenses provided that at any time prior to the sale of the items seized, the tenant may redeem the items by paying the landlord for the rent, expenses and damages.

TEACHER'S KEY

WORKSHEET #8

FARM LABOR

(For use with VAS Unit 2018d, Part 3)

1. *True* or False — A wage agreement which will last for less than a year can be oral and still be legally binding.

2. True or *False* — A person hired at will is employed for a definite period of time.

3. *True* or False — A person hired at will may resign or be discharged with no notice.

4. List the two means by which a farm employer's liability can be determined.
   a. *common law principles*
   b. *workmen's compensation*

5. When are employers covered by the Workman's Compensation Act?
   When they employ 500 or more man-days of labor during each quarter of the preceding calendar year or volunteer to do so.

6. Compare common law and workman's compensation by completing the chart below.

Characteristic	Common Law	Workman's Compensation
Speed of Payment	Often slow due to court proceedings.	Prompt. No need for court action or proof of liability.
Liability	Must be determined in court - employee may be guilty of contributory negligence.	Always covered by employer regardless of fault.
Coverage	Varies greatly. Employee may receive nothing or can be fully covered including compensation for mental anguish or pain.	Uses a standard schedule depending on injury.
Cost	Is occurred by the party found liable.	Employers must pay to have workman's compensation insurance.

7. Are agriculture workers normally covered by the Federal Minimum Wage Law? Why or why not?

   No. Most farm employers do not employ enough people for enough time to qualify.

8. Do most farm laborers qualify for unemployment insurance? Why or why not?

   No. Same as #7.

9. Under what conditions is agriculture employment subject to the unemployment compensation act?
   a. If the employer pays 20,000 in cash wages during any quarter of the previous year
   b. If the employer employs 10 or more individual employees at least one day during each of 20 different weeks

TEACHER'S KEY

WORKSHEET #9

DRAINAGE AND WATER RIGHTS

(For use with VAS Unit 2018d, Part 4)

1. What provisions must be made if a landowner alters the flow of drainage across his/her land?
   a. The drainage must drain only into the natural discharge point.
   b. The owner cannot cause the water to back up onto high land.

2. What are the local drainage districts?

3. When were the local districts established?

4. What benefits have been brought about by our drainage district?

5. According to the common laws on damming or impounding water what are the responsibilities of the landowner concerning the construction of a dam?
   a. The landowner is liable for any damage that might occur due to the alteration
   b. Cannot interfere with the use of water downstream
   c. Cannot divert the course of the stream
   d. Cannot reduce the amount of water unreasonably
   e. Cannot cause water to back up on another's property

6. What are the responsibilities of the landowner for ground water?
   a. The owner can use as much water from his/her own wells as desired regardless of how it affects other's supply.
   b. The user may not pollute or maliciously deplete the supply.
   c. If drilling a well that will penetrate the subsurface below the glacial drift, the owner must obtain a permit from the State Department of Mines and Minerals, and a log of all drilled wells must be filed with the State Geological Survey Division.

TEACHER'S KEY

WORKSHEET #10

FENCES

(For use with VAS Unit 2018d, Part 5)

1. Define a legal fence.
   Enclosure 4½' high, in good repair and capable of keeping livestock off of adjoining land

2. What materials could be used to build a fence?
   Rails, boards, stone, hedge, timber, barbwire, woven wire or whatever the fence viewers of the town or precinct consider the equivalent.

3. Who determines what constitutes a legal fence in our county?

4. What constitutes a legal fence in our county?

5. When can an owner of an electric fence be held liable for injury caused by the fence?
   When the owner is found negligent in seeing that the fence was not properly constructed or installed

6. According to Illinois law who is responsible for a division fence?
   Each owner for a just portion which is by custom usually the right half as the owner views the fence from their property

7. Who decides which portion of the fence each neighbor is responsible for?
   The owners do if they can come to a mutual agreement. If an agreement cannot be made then the county fence viewer decides.

8. Under what conditions is a landowner not responsible for his/her share of a division fence?
   When the landowner does not cultivate the land or use the land for pasture purposes. To remove an existing fence the owner must give one year's notice to the adjoining owner and allow the adjoining owner to buy his/her interest in the fence.

TEACHER'S KEY

WORKSHEET #11

LIVESTOCK

(For use with VAS Unit 2018d, Part 6)

1. Your neighbor's cow breaks out of the fence onto your newly sodden lawn. What factors must be considered in determining who is liable for damages?
   a. the ownership of the animal

   b. the condition of the fence at the location of the escape

   c. the person responsible for the area of the fence

   d. the past behavior of the animal

2. What should your neighbor do to minimize the damage?
   Retrieve the animal immediately.

3. You find an estray on your land. What could it be?
   An estray is a domesticated animal of unknown ownership. Examples might be cattle, horses, pigs, mules, goats, ass or sheep.

4. You would like to keep the estray goat, what can you do to legally claim the animal?
   a. Post a notice in three public places within five days of finding the animal.

   b. Apply for appraisal of the animal within 10-15 days.

   c. After 3 months notify the judge. If the animal is worth more than $25 the county clerk must also be notified.

5. How would this procedure change if the estray animal were a cow?
   The person wishing to take up the animal would have to wait one year before notifying the judge.

6. What would happen if the goat's owner came to retrieve the animal after 2 months had passed since you found the estray?
   The owner would need to pay the finder the costs of caring for the animal that were occurred by the finder.

7. The general rules governing animals loose on a road or highway follows the same basic principles as those covering trespassing animals. In addition to these general rules what does the law demand that a farmer do if he/she drive animals along or across the roadway.
   He/she must use whatever care is necessary to keep the animals under control and provide warning to motorists.

8. Are you required to license a dog where you live? If "yes" how can this be done?

9. Under what circumstances may you kill a dog?

   A dog can be killed if the unaccompanied dog is discovered in the act of wounding or killing a domesticated animal. A dog can be poisoned with the consent of the owner and with written permit from the Illinois Department of Agriculture.

10. When is the injured person held responsible for a dog's attack?
    a. if the person is trespassing

    b. if the person provokes the animal

    c. if the person ignores warning signs

11. The owner is responsible for damages done by a vicious animal only if the animal is known to be vicious prior to the injury.

TEACHER'S KEY

WORKSHEET #12

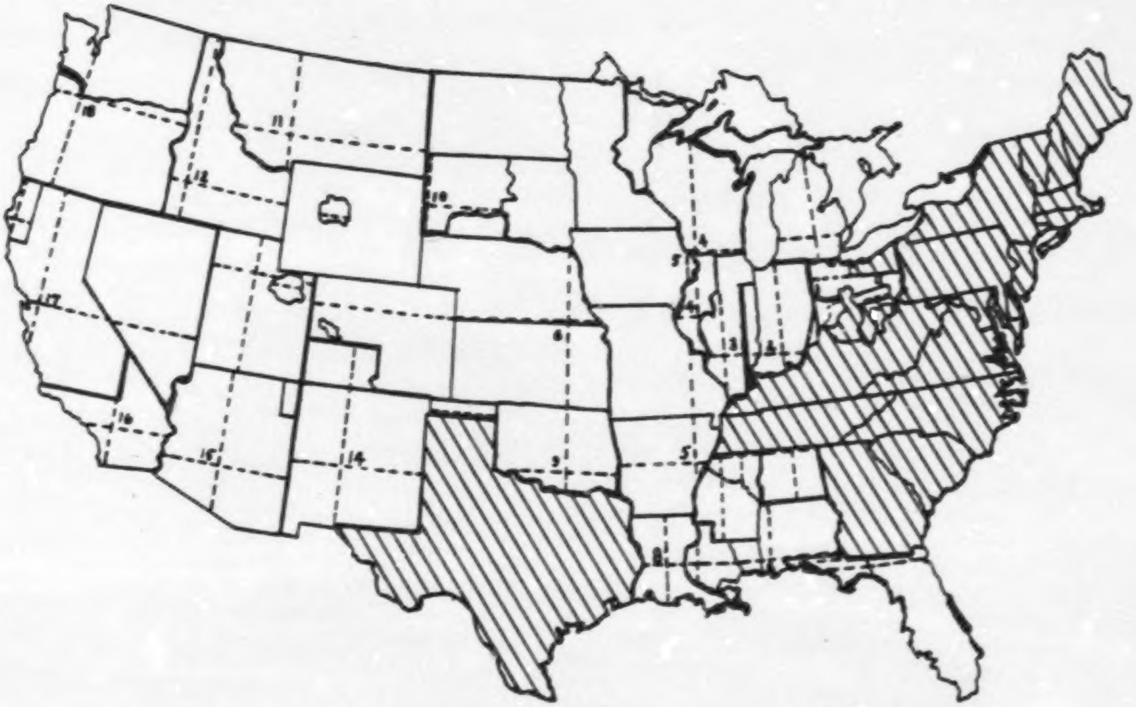
ANIMAL DISEASE LAWS

Complete the chart using the information found in VAS Unit 2018d Part 7

Disease	Control Measures	Treatment and Disposal
Rabies	- animals may be required to be inoculated and tagged - may need to confine animals for a set time period in an area of rabies occurence - animal showing symptoms should be reported to the rabies inspector - any animal that has bitten a person must be confined for 10 days	- notify rabies inspector - confine animal
Hog Cholera	- illegal to vaccinate for hog cholera - state permit and health papers are needed to transport hogs into Illinois	- must burn the carcass or bury at least 4 ft. deep - the state may order diseased animals destroyed

Disease	Control Measures	Treatment and Disposal
Brucellosis	- proper health papers must accompany animals entering the state - the owner must allow the state to test cattle for brucellosis upon request - prior to the sale, loan or service of breeding stock, proper brucellosis certification must be obtained - animals are tested using a ring test or agglutination test	- swine: must tag animals, may not use for breeding but may be sold for slaughter - cattle: may be quarantined or destroyed
Tuberculosis	- must submit all cattle for testing upon request of the state - proper health certification must be obtained for shipping, depending on the states involved - illegal to sell milk from a dairy herd until it is shown to be TB free	- positive tested animals must be tagged for slaughter

LAND DESCRIPTION SYSTEMS USED IN THE UNITED STATES

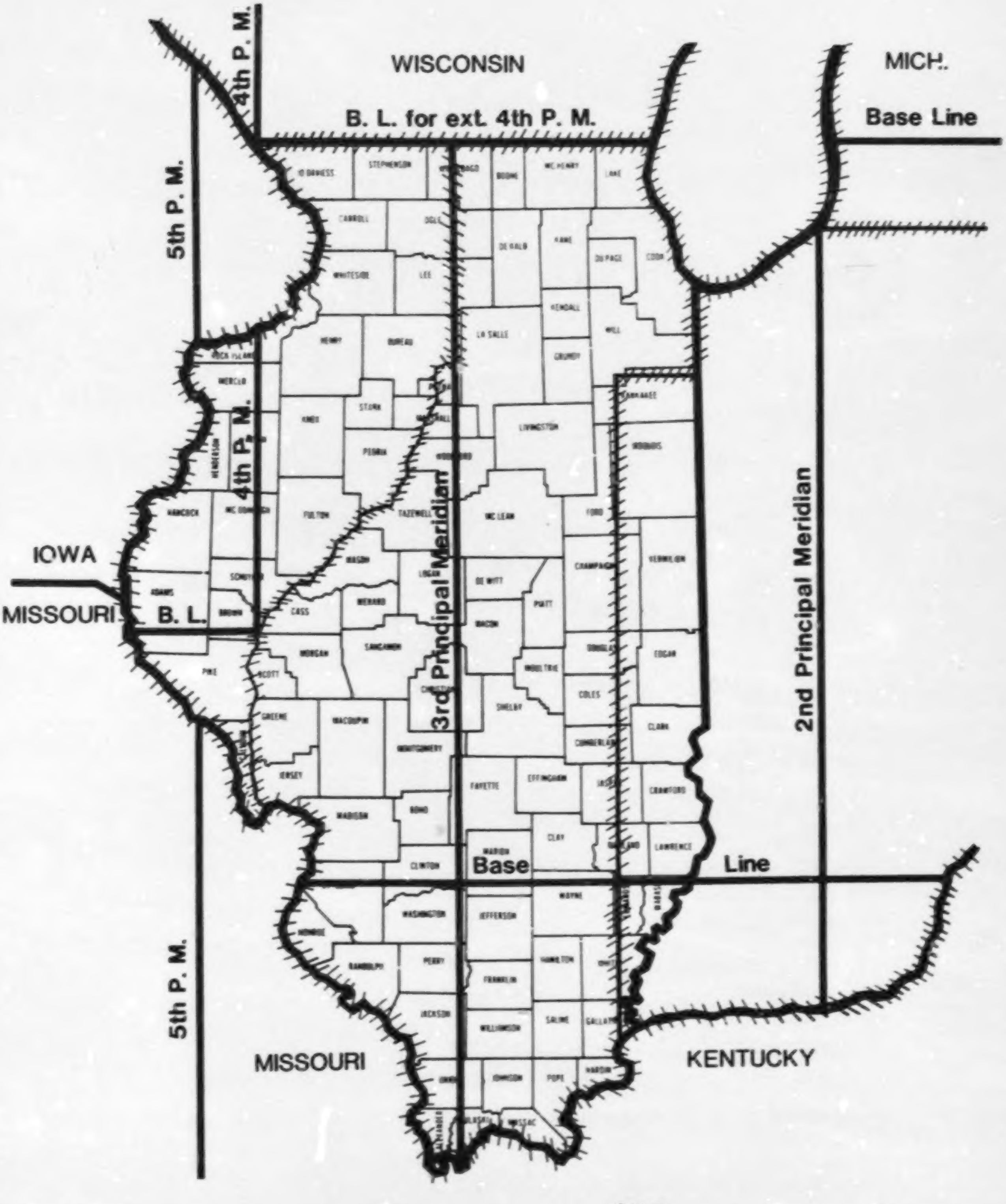

18
11
12
10
4
5
17
6
3
2
16
15
14
9
5
8

▨ – metes and bounds system

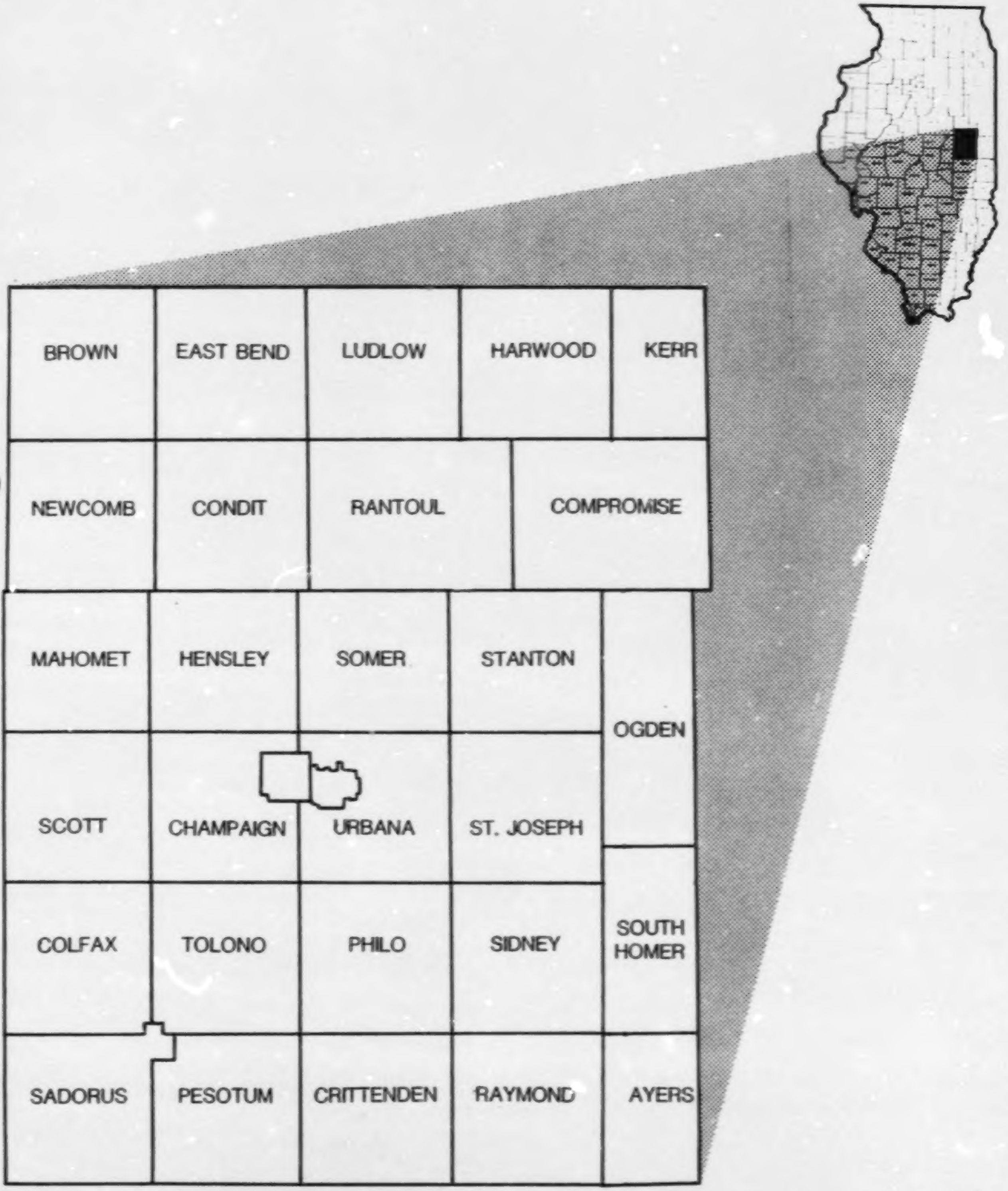
☐ – rectangular survey system

------- principal meridians and base lines

LOCATING PRINCIPAL MERIDIANS AND BASE LINES IN ILLINOIS


WISCONSIN
MICH.
B. L. for ext. 4th P. M.
Base Line
4th P. M.
5th P. M.
4th P. M.
IOWA
MISSOURI
B. L.
3rd Principal Meridian
2nd Principal Meridian
Base
Line
5th P. M.
MISSOURI
KENTUCKY

LOCATING TOWNSHIPS WITHIN A COUNTY


BROWN
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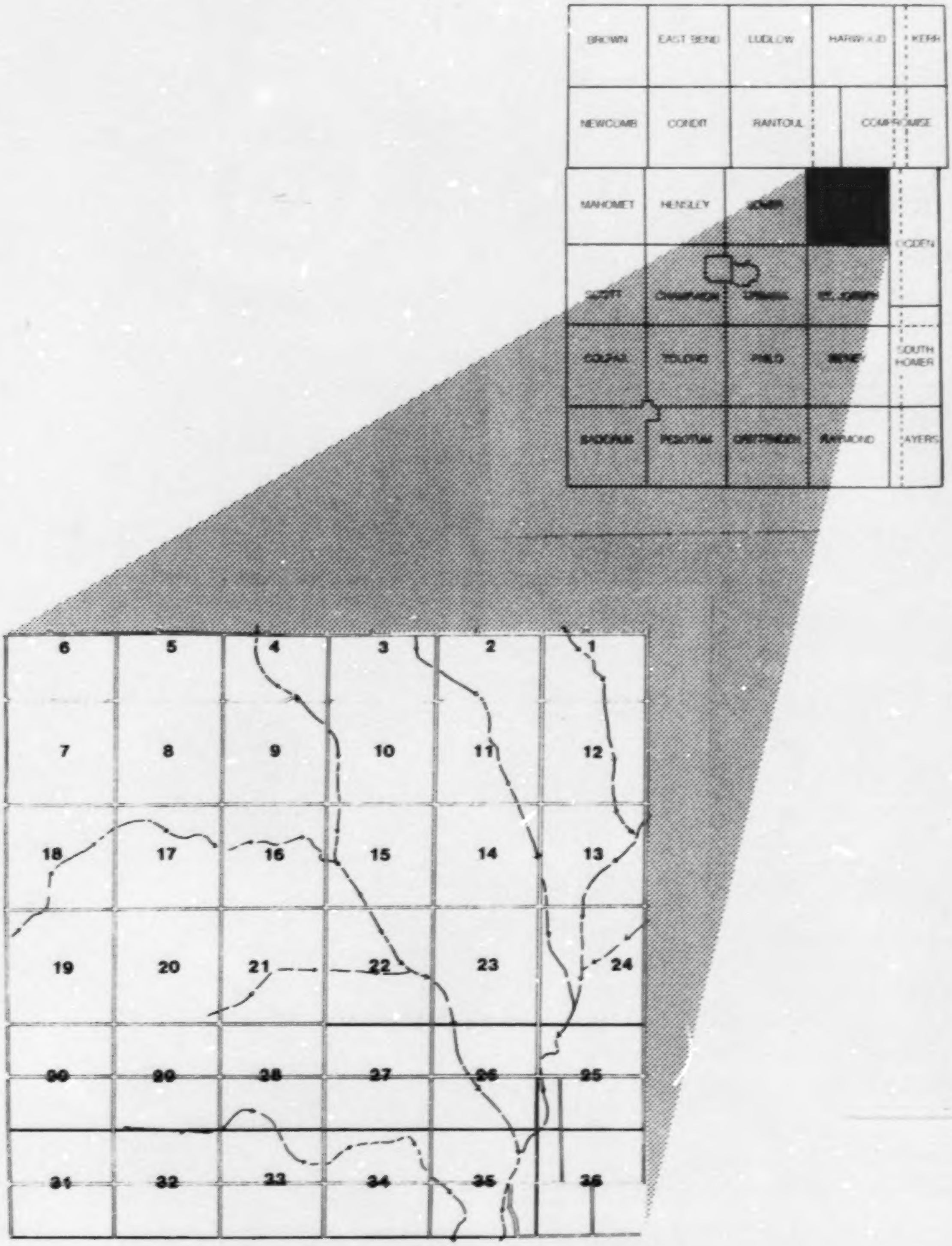
LUDLOW
HARWOOD
KERR
NEWCOMB
CONDIT
RANTOUL
COMPROMISE
MAHOMET
HENSLEY
SOMER
STANTON
OGDEN
SCOTT
CHAMPAIGN
URBANA
ST. JOSEPH
COLFAX
TOLONO
PHILO
SIDNEY
SOUTH HOMER
SADORUS
PESOTUM
CRITTENDEN
RAYMOND
AYERS

LOCATING SECTIONS WITHIN A TOWNSHIP


BROWN
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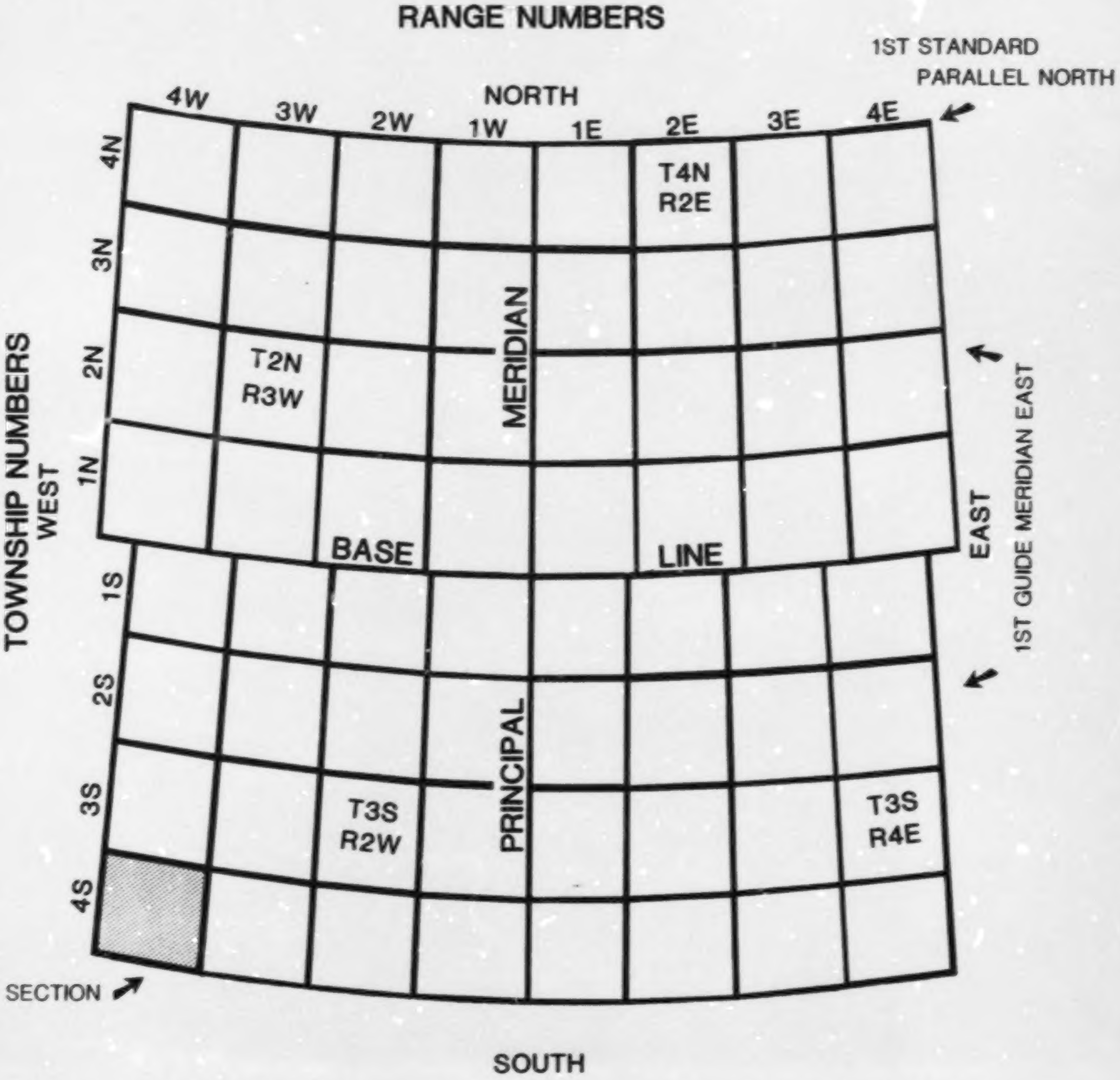
NEWCOMB
CONDIT
RANTOUL
COMPROMISE
MAHOMET
HENSLEY
SOMER
OGDEN
SCOTT
CHAMPAIGN
URBANA
ST. JOSEPH
COLFAX
TOLONO
PHILO
SIDNEY
SOUTH HOMER
SADORUS
PESOTUM
CRITTENDEN
RAYMOND
AYERS
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

LOCATING TOWNSHIPS

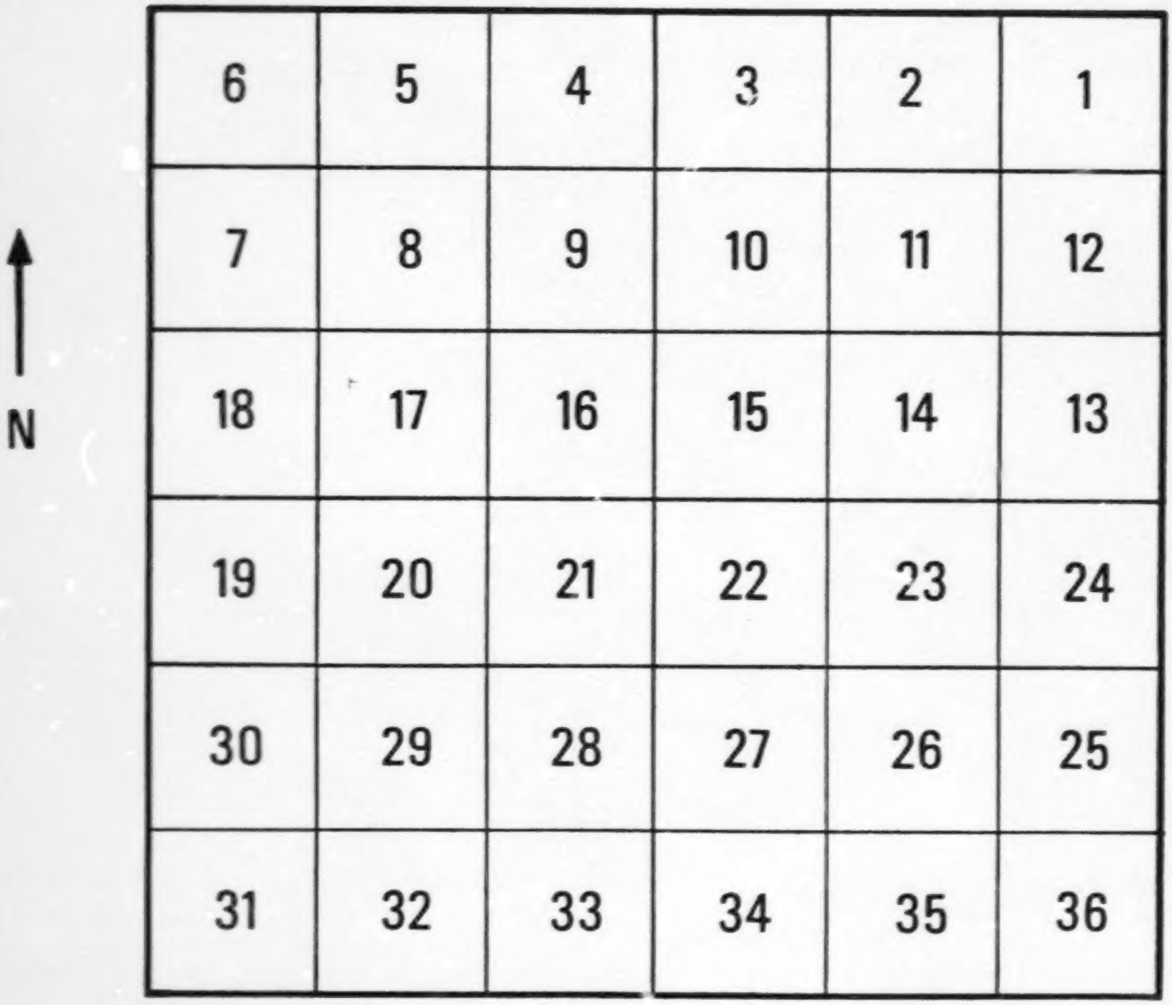

RANGE NUMBERS
1ST STANDARD PARALLEL NORTH
NORTH
4W
3W
2W
1W
1E
2E
3E
4E
4N
3N
2N
1N
1S
2S
3S
4S
T4N R2E
T2N R3W
T3S R2W
T3S R4E
MERIDIAN
PRINCIPAL
BASE
LINE
TOWNSHIP NUMBERS
WEST
EAST
1ST GUIDE MERIDIAN EAST
SECTION
SOUTH

THE LOCATION OF A TOWNSHIP IS DETERMINED BY ITS POSITION FROM A MERIDIAN AND BASE LINE.

REASONS FOR TOWNSHIP AND SECTION IRREGULARITIES

1. CONVERGENCE OF PRINCIPAL MERIDANS AS THEY APPROACH THE NORTH AND SOUTH POLES
2. TOWNSHIPS WERE SURVEYED ACCORDING TO DIFFERENT SETS OF INSTRUCTIONS
3. SURVEYS MEETING FROM TWO DIFFERENT MERIDIANS OR BASE LINES
4. NATURAL BOUNDRIES – RIVERS, LAKES, ETC.
5. ERRORS IN THE ORIGINAL SURVEY

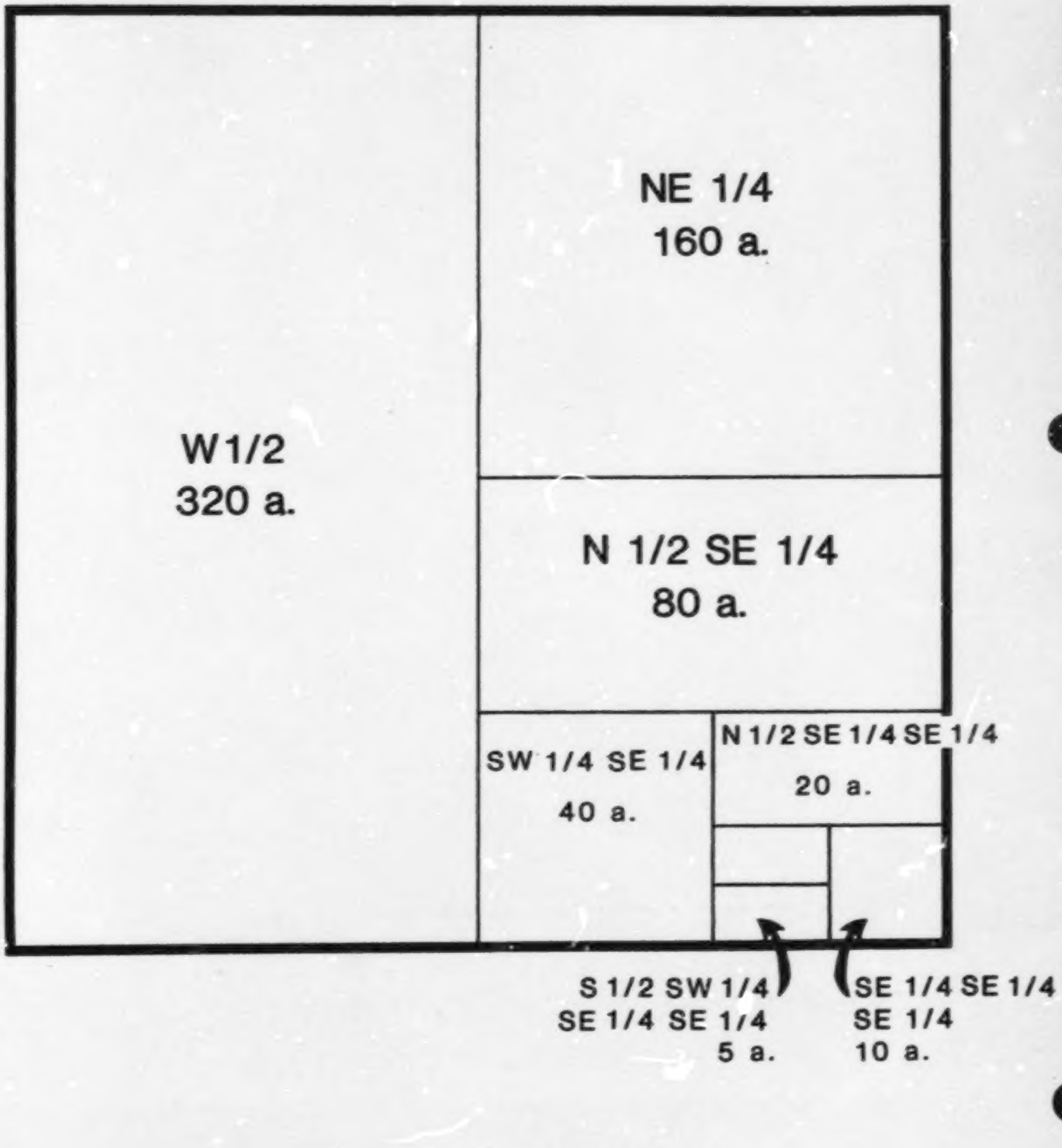
NUMBERING OF THE SECTIONS WITHIN A TOWNSHIP



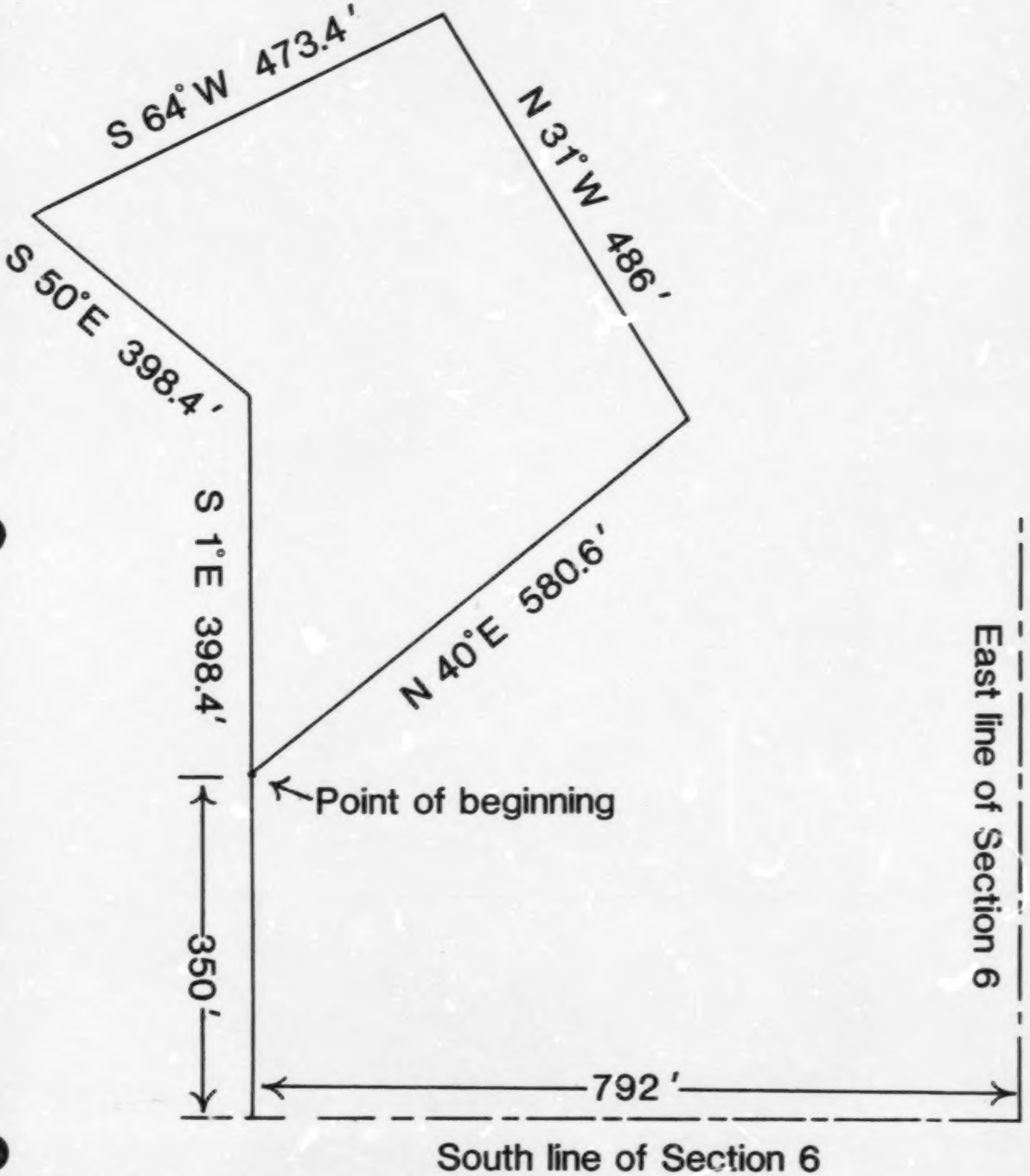
6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

A TOWNSHIP IS DIVIDED INTO 36 ONE-MILE-SQUARE SECTIONS

A SECTION DIVIDED INTO SMALLER TRACTS


NE 1/4
160 a.
W1/2
320 a.
N 1/2 SE 1/4
80 a.
SW 1/4 SE 1/4
40 a.
N 1/2 SE 1/4 SE 1/4
20 a.
S 1/2 SW 1/4
SE 1/4 SE 1/4
5 a.
SE 1/4 SE 1/4
SE 1/4
10 a.

SAMPLE METES AND BOUNDS LAND DESCRIPTION


S 64° W 473.4'
N 31° W 486'
S 50°E 398.4'
S 1°E 398.4'
N 40°E 580.6'
Point of beginning
350'
792'
East line of Section 6
South line of Section 6

1" = 150'

FACTORS CONSIDERED IN ESTATE PLANNING

FAMILY NEEDS– CHILDREN, SPOUSE, RETIREMENT

FAMILY INTEREST AND CAPABILITY IN FARMING

VALUE OF REAL ESTATE AND OTHER PROPERTY

HOW TITLE IS HELD

AMOUNT OF PROPERTY THAT CAN BE EASILY CONVERTED TO CASH

LIFE INSURANCE HOLDINGS

ESTATE, GIFT AND INHERITANCE TAX

BENEFITS OF ESTABLISHING A WILL

PROPERTY CAN BE DISTRIBUTED ACCORDING TO THE WISHES OF THE DECEASED

AN EXECUTOR MAY BE DESIGNATED

A GUARDIAN CAN BE NAMED

THE COST AND TIME OF SETTLING THE ESTATE MAY BE REDUCED

MISUNDERSTANDING BETWEEN FAMILY MEMBERS CAN BE PREVENTED

STEPS IN BUYING FARM PROPERTY

1. FIND A CREDIT AGENCY TO FINANCE THE PURCHASE

2. HAVE AN ATTORNEY DRAW UP A CONTRACT WITH THE SELLER

3. REACH AN AGREEMENT WITH THE CREDIT AGENCY

4. HAVE A WARRENTY DEED EXECUTED BY THE SELLER

5. HAVE THE ABSTRACT AND CHECK FOR LIENS, JUDGEMENTS AND OTHER OBLIGATIONS AGAINST THE PROPERTY

6. OBTAIN NECESSARY INFORMATION CONCERNING TENANTS, EASEMENTS, MINERAL RIGHTS, SCHOOL DISTRICT, ETC.

7. HAVE ANY DEFECTS IN TITLE CLEARED

8. HAVE THE DEED RECORDED

9. CHECK THAT THE MORTGAGE AND NOTES ARE IN ACCORD WITH THE ORIGNAL AGREEMENT

Materials developed by H. W. Hannah and N. G. P. Krausz.

TRANSPARENCY GUIDE
UNDERSTANDING BASIC AGRICULTURAL LAW AND LEGAL LAND DESCRIPTIONS

I. Transparency--LAND DESCRIPTION SYSTEMS USED IN THE UNITED STATES

  A. Discuss the locations where each system is utilized. Although the map shows the major system used in each state, nearly all states use both systems to some extent.

  B. Have the students identify advantages and disadvantages of each system.

II. Transparency--LOCATING PRINCIPAL MERIDIANS AND BASE LINES IN ILLINOIS

  A. Locate the base line and principal meridian used in surveying the local area.

  B. Discuss the reasons for establishing base lines and principal meridians.

III. Transparency--LOCATING TOWNSHIPS WITHIN A COUNTY

  A. Discuss how the local county boundaries were determined. Point out that counties in Illinois vary in size and thus the number of townships within the county.

  B. Discuss the differences in political townships and legal townships.

  C. Ask the students to estimate the total acreage within the county.

IV. Transparency--LOCATING SECTIONS WITHIN THE TOWNSHIP

  A. Discuss the size of the township and each section within the township.

  B. Discuss the details included on the map, i.e., owners name, acreage size, house location, waterways, and roads.

  C. Have the class develop a list of possible uses for the information included on a section map.

V. Transparency--LOCATING TOWNSHIPS

  A. Explain the directions and terminology used in describing township locations.

B. Have the students determine the range and township descriptions of various townships.

C. Ask students to locate a township given the range and township directions.

VI. Transparency--REASONS FOR TOWNSHIP AND SECTION IRREGULARITIES

A. Discuss the items included on the transparency.

B. Refer back to transparencies III and IV, have the class identify irregular townships and sections, and discuss the possible reasons for their irregularity.

VII. Transparency--NUMBERING OF THE SECTIONS WITHIN A TOWNSHIP

A. Explain that the numbering of townships always starts in the northeast corner and proceeds west then south and east in a snake-like fashion concluding with the thirty-sixth section in the southeast corner.

VIII. Transparency--A SECTION DIVIDED INTO SMALLER TRACTS

A. Using the transparency discuss the various tract/field sizes frequently found within a section and their legal land description.

B. Distribute copies of a county township and discuss how the sections are subdivided.

IX. Transparency--SAMPLE METES AND BOUNDS LAND DESCRIPTION

A. All metes and bounds tract descriptions must originate from a describable point or location. For this example the southeast corner of section 6, R2W, T1S of the fourth principal meridian will be used as the point of reference.

Commencing at the SE corner of the said section 6, thence west along the section line 792 feet; thence north 350 feet for a place of beginning; thence north 40° east 580.6 feet; thence north 31° west 486 feet; thence south 64° west 473.4 feet; thence south 50° east 290.6 feet; thence south 1° E 398.4 feet back to the point of beginning.

B. Discuss the value of using a metes and bounds description when dealing with small and oddly shaped tracts of land.

X. Transparency--FACTORS CONSIDERED IN ESTATE PLANNING

   A. As a class, discuss the factors listed and how each item might affect estate planning.

   B. Have the class give examples of changes which may result in changes in estate planning.

XI. Transparency--BENEFITS OF ESTABLISHING A WILL

   A. Discuss the benefits listed.

   B. Have the students consider when they would decide to establish a will.

XII. Transparency--STEPS IN BUYING FARM PROPERTY

   A. Review the steps listed. Ask the students to explain the importance of each step.

TEACHER'S KEY
SAMPLE TEST QUESTIONS
LAW FOR THE FARMER

TRUE(+) or FALSE(0)

+ 1. Professional legal service obtained in due time is the most economical way of handling issues that are potentially controversial or doubtful.

0 2. An abstract is a guaranty of good title.

0 3. Most countries in Illinois use the "Torrens system" of registering land titles.

+ 4. The most important purpose of a will is to distribute property according to the personal desires of the maker.

0 5. After an estate is distributed, the executor bills the beneficiaries for the inheritance tax.

+ 6. Transfers of property that qualify for a marital deduction, charitable deduction, or annual gift exclusion are not subject to the gift or estate tax.

+ 7. Only occupants of the land in question are excused from getting a license to hunt or fish on it.

0 8. Fruit on a neighbor's tree hanging over your property belongs to you.

+ 9. A land owner may use any amount of ground water as long as it is taken from his own well, even if it deprives other people of their supply.

+ 10. Law allows the owner of domestic animals to kill dogs not accompanied by their owners when the dogs are in the act of wounding or killing domestic animals.

MULTIPLE CHOICE (Choose best answer)

F 1. For a valid will in Illinois:

A. The maker must be of sound mind and memory and at least 18 years old.
B. The will must be in writing and signed by the maker.
C. Two or more credible witnesses must sign the will.
D Only A and C are needed.
E. Only B and C are needed.
F. A, B, and C are needed.

D 2. A will can be revoked by:

A. Burning or tearing it in small pieces.
B. Making a new will, and preferably declaring in the new will that the former will is revised.
C. By declaring in writing that the former will is revised and having the declarations signed and witnessed in the same way as the former will.
D. Any of the above.
E. All of the above.
F. None of the above.

__A__ 3. As relationship of beneficiary to decedent becomes more distant, the Illinois inheritance tax rate:

A. Becomes higher.
B. Becomes lower.
C. Is not affected.

__C__ 4. Real estate in Illinois is assessed:

A. Every year.
B. Every two years.
C. Once every four years.
D. Anytime, depending on inflation.

__B__ 5. The owner of a farm which is lower than an adjoining farm should:

A. Sue the adjoining farmer for water damages he incurs due to the neighboring farm's drainage.
B. Take the water that flows naturally to his land or arrange for its drainage.
C. Build a dam to back the water up on his neighbor's land and keep it off of his own land.

__E__ 6. If a hog dies of cholera, the owner:

A. Should burn the carcass immediately.
B. Release it to a person licensed to dispose of dead animals.
C. Should bury the carcass more than four feet deep.
D. A or B.
E. A or B or C.

__B__ 7. Farmers must have a license to apply pesticides if:

A. They apply pesticides only on their own premises.
B. They apply pesticides for two or more other farmers during a year.
C. They farm more than 640 acres.
D. Farmers never need a license to apply pesticides.

__D__ 8. Laws dealing with agriculture are important to:

A. Tenants.
B. Landlords.
C. Hired farm laborers.
D. All of the above.

__E__ 9. Those persons excused from getting a license are:

A. Boys and girls under 16 -- to fish with a hook and line.
B. Occupants of land -- to hunt, fish, or trap.
C. A landlord who rents to a tenant and makes proper arrangements in the lease -- to hunt, fish, or trap on the land he owns.
D. All of the above.
E. A and B.

__A__ 10. Trespassing animals damaging property may be taken up and kept until their owner makes good on the damage done; however, the person taking them up must notify the owner (if he knows the owner):

A. In 24 hours.
B. Immediately.
C. In 8 hours.
D. In 7 days.

MATCHING (Match the correct phrases with the qualities listed.)

F 1. Used to clear titles to property.
G 2. A summary of facts in all conveyances or encumbrances affecting the land.
I 3. Takes land at death of life tenant if no one else is designated.
J 4. Designated to take land at death of life tenant.
E 5. 1980 minimum wage for covered agricultural employees.
C 6. Tax credit on estates for 1981 and beyond.
A 7. Lowest estate tax rate applied above the exemptions.
B 8. Provides protection for landlord and tenant.
L 9. "Husband, wife, child," Illinois inheritance tax exemption on inheritances of less than $270,000.
D 10. Levee Act and Farm Drainage Act combined into a single act.
H 11. Penalty for trespassing: $ ________ fine or 30 days in jail, maximum.

A. 32 percent
B. written lease
C. $47,000
D. Illinois Drainage Code
E. $3.10
F. quitclaim deed
G. abstract of title
H. $500
I. Reversioners
J. Remaindermen
K. $2.75
L. $40,000
M. Title Clearance Law
N. Land Manager
O. 45 percent
P. $2,000

COMPLETION (Write appropriate information or words to complete statements.)

1. The two types of warranties a seller of property may make are express and implied.

2. The system commonly used for registering titles to land in the largest county in Illinois, Cook county, is known as the Torrens system of registering titles to land.

3. Title insurance provides purchasers of real estate with security against any imperfections in his title that may later appear.

4. An amendment to a will may be made by a Codicil.

5. According to Illinois law a legal fence is an enclosure four and one-half feet high, in good repair and capable of keeping livestock off adjoining land and highways.

6. Two things which determine the amount of property tax a farmer pays are assessed valuation of their property and the rate (%) of the tax levy.

7. Lateral support is the support to land in its natural state from the land which lies next to it.

8. Illinois minimum wage law has a 500 man-day per quarter exemption.

9. Estray is the legal term for a domestic animal running at large, excluding dogs, cats, and poultry.

10. The use of DDT is illegal unless a permit is obtained from the Director of the State Department of Agriculture.

ESSAY QUESTIONS

1. Explain the conditions that a tenant must meet in order to remove improvements from a farm.

   (See page 15 of unit.)
   a. The tenant must not owe the landlord back rent, or the landlord may hold the improvement.

   b. The tenant must have put the improvements on the land himself.

   c. The tenant must remove the improvements before his term expires.

2. Discuss three legal considerations that apply to farm labor.

   (See page 15 - 17 of unit.)
   a. Examples: Many short-term agreements are oral. However, if the term of employment agreed on is for a year or more, the agreement to be enforceable must be in writing and signed by both the employer and employee.

   b. A farm employee's liability will either be determined by common law principles (such as related to employer's negligence) or under Workmen's Compensation principles.

   c. Most farmers employing 500 man-days or more of labor during a calendar quarter take out Workmen's Compensation insurance (and some with less than that if they want to be covered by the insurance).

   d. A farmer is not covered under the Minimum Wage Law unless he hires at least 500 man-days of labor during a calendar quarter.

   e. A farmer is not covered under the Employment Compensation Act unless he pays $20,000 of cash wages in a calendar quarter or employs more than 10 employees on at least 1 day during each of 20 weeks.

TEACHER'S KEY
SAMPLE TEST QUESTIONS
LAND SURVEYS AND DESCRIPTIONS

TRUE (+) - FALSE (O)

0 1. A legal chain has 50 links.

+ 2. The United States was the first country to use a rectangular system of land survey.

+ 3. A clear title means that there are no legal claims against the ownership of property.

0 4. In 1785, the Illinois State Legislature passed a law directing that a rectangular system be used in surveying all Illinois public lands.

+ 5. A land title, or a title to a tract of land, is evidence of ownership.

+ 6. The location of the township is determined by the principal meridian and base line.

+ 7. Ten square chains are equal to one acre.

+ 8. Difficulties sometimes occur with the metes and bounds system when rocks or trees are used as markers.

0 9. A rod (distance) is 4 yards or 12 feet in length.

0 10. Most of Illinois has been surveyed by the metes and bounds system.

MULTIPLE CHOICE (Make appropriate choice of A, B, C, or D)

B 1. A legal chain is ______ feet long.

A. 50
B. 66
C. 88
D. 100

C 2. There are ________ square miles in a regular township.

A. 6
B. 16
C. 36
D. 160

D 3. Irregular townships and sections occur because of:

A. The meeting of two different surveys
B. Surveyors' errors
C. Curved surface of the earth
D. All of the above

C 4. In the Eastern part of the United States, the main system used for describing land was:

A. Rectangular land survey
B. Permanent markers
C. Metes and bounds
D. None of the above

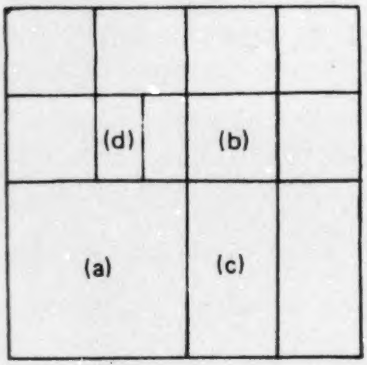


Fig. 1. Four tracts of land within a section.

D 5. The number of acres in (a) above (Fig. 1):

A. 20
B. 40
C. 80
D. 160

D 6. The description of (b) above (Fig. 1):

A. S.E.¼ of N.E.¼
B. S.W.¼ of N.W.¼
C. S.W.¼ of S.W.¼
D. S.W.¼ of N.E.¼

A 7. Description of (c) above (Fig. 1):

A. W.½ of S.E.¼
B. W.½ of S.W.¼
C. W.½ of N.E.¼
D. E.½ of S.E.¼

B 8. Acres in (d) above (Fig. 1):

A. 5
B. 20
C. 40
D. 80

C 9. There are ______ sections in a regular township.

A. 6
B. 16
C. 36
D. 160

A 10. Acres in a tract of land that is one mile by three-quarter mile:

A. 480
B. 320
C. 240
D. 120

MATCHING (Select the matching answer from the right column that most accurately or appropriately fits each item or description in the left column.)

E	1.	Tract of land one-quarter mile by one-half mile.
I	2.	Tract of land one-half mile by three-quarters of a mile
C	3.	A square 160 acres
K	4.	A square 40 acres
F	5.	A rod (measure of distance)
B	6.	Surveyor's chain (legal chain)
M	7.	One acre
H	8.	Evidence of ownership
J	9.	Part of a legal description
A	10.	Township

A. 36 sections
B. 66 feet
C. 160 rods by 160 rods
D. 120 acres
E. 80 acres
F. 5½ yards
G. 40 rods by 40 rods
H. Clear title
I. 240 acres
J. SW¼ of Section 7
K. 80 rods by 80 rods
L. Abstract
M. 160 square rods
N. 15½ feet

COMPLETION (Write appropriate information or words to complete statements.)

1. To make possible private ownership and property transfer, it is essential to have a system through which a purchaser can obtain a clear title to any tract of land.

2. A regular township - - that is, a survey township and not a governmental subdivision - - is six miles square.

3. A township is located with reference to its base line and principal meridian.

4. The legal description of property is given on many documents and papers, such as abstracts, deeds, and tax statements.

5. Sections in a township are numbered from 1 to 36 beginning at the upper right, or northeast corner of the township.

6. In order to transfer real estate, its location must be positively and specifically described.

7. Meridians are north and south lines.

8. Base lines are east and west lines.

9. A description according to the metes and bounds system must have a starting place and continue for specified distances along lines called courses until the tract has been circumscribed and the starting point again reached.

10. Title to real estate is dependent upon a legal description of property based on an official survey.

ESSAY QUESTIONS

1. Relate how private ownership of land and property transfer is dependent upon an official survey.

   (See page 1 of subject matter unit)

2. Briefly describe the two systems of land surveys and descriptions used in the United States.

   (See pages 1-3 of subject matter unit)

UNIT I: AGRICULTURAL BUSINESS MANAGEMENT

PROBLEM AREA: PLANNING AN AGRICULTURAL PRODUCTION BUSINESS

SUGGESTIONS TO THE TEACHER:

This problem area is essentially an exercise in planning or replanning a farm business. The justification for teaching farm planning to students of vocational agriculture, many of whom are not farm-oriented, is based on the following assumptions:

1. Many of the principles and concepts used in farm planning can be applied to non-farm, business planning and to planning in general.

2. The farm business is the type of small business most prevalent in rural communities.

3. Real examples in the local community and problem farm information from Vocational Agriculture Service are available to most teachers.

4. Most vocational agriculture students can relate better to planning a farm business than they can to planning a non-farm business.

This problem area includes information and teaching materials for the following areas which are considered to be the essential steps in farm planning:

1. Inventorying the farm resources
2. Planning the land-use program
3. Estimating the value of crop production
4. Planning the livestock program
5. Estimating the value of livestock production
6. Estimating labor needs
7. Estimating the costs for buildings, equipment, and fertility
8. Estimating net earnings
9. Planning to meet credit needs

In addition, an introductory section on the definition and importance of planning is included. Lists of anticipated problems and concerns of students have been developed for each of these steps or parts, so teachers can choose the areas they wish to teach and still use the teacher's guide.

No recommendation on the amount of time needed to teach this problem area is given since this will depend on how many of the steps are taught and the depth of the instruction. Conceivably, one could spend an entire semester on this problem area; however, most teachers will probably want to limit the instruction to a shorter period so that other important problem areas can be covered.

A decision regarding how the farm planning problem is to be handled must be made early in the year by the instructor. Choices include using the farm problem provided by Vocational Agriculture Service which is probably the easiest and best way to go. However, some teachers may want to use a local farm as an example or have students do planning for their own farms. Some teachers may choose a combination of these approaches.

The teaching approach and the selected content will affect the instructional materials that need to be obtained. These materials should be ordered early so they can be reviewed and studied in advance of the time instruction is to begin.

In teaching this area teachers should utilize computer software whenever possible. Students should be exposed to the many possibilities for using the computer to plan an agricultural business. Descriptions of selected computer programs available from Vocational Agriculture Service are included in the Teacher's Guide.

CREDIT SOURCES:

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The teacher's guide, student worksheets, information sheets and test questions were developed by Paul E. Hemp, Department of Vocational and Technical Education, University of Illinois, and reviewed by William P. Hunter, Specialist in Agricultural Economics, Vocational Agriculture Service.

Additional suggestions and recommendations were provided by the following Illinois teachers of vocational agriculture who reviewed the early drafts:

Clarence Tipton - Serena High School
Floyd Wohrley - Kewanee High School
Everett Moeller - Beecher High School

TEACHER'S GUIDE

I. Unit: Agricultural business management

II. Problem area: Planning an agricultural production business

III. Objectives: At the close of this problem area, students will be able to:

1. List the steps in planning a farm or non-farm, agricultural business.
2. Explain the value and importance of planning an agricultural business.
3. Use the planning forms included in this problem area correctly.
4. Develop a plan for a farm or non-farm business and justify its contents.
5. Utilize a computer to make planning decisions.

IV. Suggested interest approaches:

1. Ask students to name common life activities where a plan is necessary and/or desirable, i.e., game plan for an athletic contest, building plan for construction, plan for a vacation trip.
2. Announce the problem area to be studied. Write it on the chalkboard and explain to the class what the nature and scope of the problem area is.
3. Emphasize the relevance of this problem area to all members of the class. Explain how the principles learned might be applied to planning in the non-farm sector.
4. Raise the following thought-provoking questions related to planning:
    a. "Why do most farmers raise corn and soybeans rather than oats or wheat?"
    b. "Why do some farmers restrict their farm production to cash crops?"
    c. "How large should a farm business be?"
    d. "What factors affect what a farmer grows or produces on his or her farm?"
5. Discuss how the problem area may benefit class members now or in the future. Remind students that farmers and other entrepreneurs are responsible for planning their businesses.

V. Anticipated problems and concerns of students:

A. Introduction to Farm Planning

1. What is farm planning?
2. What are the steps in farm planning?
3. How is the size of a farm business measured?
4. How can the size of a farm business be increased?
5. How should one determine the best size of business?
6. How has the size of farms changed during the past 50-60 years?
7. What is a "family farm"? a "corporation farm"?
8. How does non-farm work or income affect the size of farm business one can handle?
9. What resources are used in farm production?
10. What is "management"? Why is it important?

B. Inventorying Resources for Farm Planning

1. What is an inventory?
2. What resources need to be inventoried?
3. What information should be collected for each of these resources?
4. What farms can I use to take an inventory?
5. Where can I obtain the necessary information?

C. Planning the Land-use Program

1. How are crops classified and what are some examples of crops that fit each classification?
2. What crops grown in Illinois are high-profit crops?
3. What crops grown in Illinois are best for erosion control? Why?
4. Which crops are the heaviest feeders of soil nutrients?
5. How can I decide which crops to grow?

6. What crop sequences can be used successfully in this community?

7. Under what conditions should I adjust the cropping system originally planned?

8. What is "sound land use"?

9. Why should we follow a sound land use program? Consider this question from the viewpoint of both the owner operator and society as a whole.

10. What factors should be considered in selecting a cropping system?

11. What are some rotations and cropping systems commonly used in this area?

12. What does the formula 2-1-2 mean when referring to cropping systems?

13. What are the eight land classes and how should they be used?

14. How can we estimate probable soil loss for various cropping systems?

15. What is the universal soil loss prediction equation and how can it be used?

D. Estimating the Value of Crop Production

1. Why do we need to estimate the amount and value of crops to be produced under a particular cropping system?

2. What factors affect crop yields?

3. What sources of information are useful in estimating crop yields?

4. What farms can be used to estimate crop production?

E. Planning the Livestock Program

1. What functions do livestock perform on a farm?

2. Which classes of livestock are best suited to a farm where a lot of roughages are produced?

3. Which classes of livestock require high percentages of concentrates in their diet?

4. Which classes of livestock require the greatest amount of labor?

5. Which classes of livestock require the greatest amount of capital?

6. What are "competing enterprises"?

7. What are "complementary enterprises"?

8. What is a "supplementary enterprise"?

F. Estimating the Value of Livestock Production

1. Why should the value of livestock production be calculated?

2. What forms can be used for this purpose?

3. How should the farms be completed and used?

G. Estimating Labor Needs

1. What kinds or types of labor are used on farms?

2. What are some problems employers face when they hire seasonal labor?

3. What are some problems which must be handled when hiring full-time workers hired on a year-around basis?

4. How can a farmer reduce labor needs on the farm?

5. What is a labor distribution chart and how is it used?

6. How can a farmer improve work conditions and job satisfaction for employees?

7. What forms can be used to estimate labor needs?

8. Where can information and standards for labor needs be obtained?

H. Estimating Costs for Buildings, Equipment and Fertility

1. What forms can be used to estimate building, equipment, and fertility costs?

2. Where can information regarding these costs be obtained?

3. What is the difference between equipment and buildings?

4. What is "mechanization"? How has it affected agriculture?

5. What is the principle of "resource substitution"?

6. What is the difference between fixed costs and operating costs?

7. How can fixed costs of machinery and equipment be reduced?

8. What factors should be considered in buying machinery and equipment?

9. What can be done after machinery and equipment have been purchased to keep operating costs down?

10. What economic considerations should be kept in mind when planning a fertility program?

11. How can a farmer decide how much fertilizer to apply?

12. What is the principle of diminishing returns and how does it apply to the planning of a fertility program?

13. What is the principle of equimarginal returns and how can it be used in planning a program?

14. What can a farmer do to get the most from his fertilizer dollar?

15. What is a fertility build-up program?

16. What forms can be used to estimate fertility costs?

17. Where can information regarding fertility needs of crops be obtained?

I. Estimating Net Earnings

1. What forms are used to estimate earnings?

2. How can alternative farm plans be compared and used?

3. How should "income possibilities" forms be used?

J. Planning to Meet Credit Needs

1. How can credit needs for a given farm plan be estimated?

2. How can a farmer decide whether or not to borrow money for a particular activity or investment?

3. When does it pay to borrow money?

VI. Suggested learning activities and experiences:

1. Conduct an interest approach to accomplish the following:

a. Create student interest.

   b. Convince students of the importance of this problem area.

   c. Provide students with an overview of the problem area.

2. Lead class in a discussion of desired and probable learning outcomes of this problem area. Refer to objectives listed in Section III.

3. Conduct an orientation session using the problems and concerns listed under Introduction to Farm Planning in Section V. Information on questions which require a specific answer can be found in VAS Units 2001b and 2013a. Other questions call for opinion and can be used to bring out different points of view.

4. After conducting an orientation or introductory session for this problem area, organize remaining instruction in one of the following ways:

   a. Conduct class discussion and study for each of the 9 steps included in this problem area and then involve students in the farm problem available from Vocational Agriculture Service.

   b. Conduct class discussion and study for one of the steps (take them in sequence) and then have students do this operation for the farm problem.

5. Each of the 9 steps included in this problem area can be handled as separate mini problem areas. For example, the first step, "Inventorying Resources for the Farm Plan," can be developed as a problem area by developing a list of student problems and concerns, discussing these problems and concerns, and then having students actually conduct an inventory of farm resources.

6. Repeat this problem identification-study-application process for each of the 9 steps.

7. Utilize transparencies, filmstrips, and subject matter units to provide information and to develop solutions to problems. Use other reference material as needed.

8. Select a resource person who has done a good job of planning a farm business and bring him or her into the class to present the plan and explain why it is followed.

9. Encourage and/or require students to develop a plan for their home farm. If time is a problem, only certain planning activities may be required.

10. Use the computer whenever possible to make planning decisions or to illustrate problem solving exercises.

VII. Application procedures:

1. For those students who live on farms or have relatives who live on farms, direct applications of this problem area to a real-life situation may be possible.

2. For other students, parts of the problem area may be applied to S.O.E. programs or to other life areas where planning is needed.

VIII. Evaluation:

1. Develop and administer a pencil-paper test using sample questions included in this problem area.

2. Grade student farm plans for completeness and accuracy.

IX. References and aids:

1. VAS Unit 2001b — Planning a Profitable Farm Business

2. VAS Unit 2013a — Planning to Have an Adequate Size of Business

3. VAS Unit 2002b — Inventorying Resources for Farm Planning

4. VAS Unit 2003b — Planning the Cropping System

5. VAS Unit 2006b — Choosing Specific Crops to Grow and Estimating Production

6. VAS Unit 2012b — Planning Livestock for the Farm

7. VAS Unit 2010b — The Soil Fertility Program--Economic Considerations

8. VAS Unit 2043 — Income Possibilities for Your Farm

9. VAS Unit 2004a — Field Arrangement Principles

10. VAS Unit 2039a — Fitting Machinery and Equipment to the Farm

11. VAS Unit 2035a — Balancing the Labor Supply and the Farm Business

12. Planning Your Farm Business, by J. H. Herbst and revised by D. J. Balzer, 1982 edition.

13. Key to Planning Your Farm Business.

14. Farm Management Manual, 1983.

15. Problem Illustration for Planning Your Farm Business.

16. Income Possibilities on Your Farm.

17. Partial Budgets and "Break-Even" Problems.

18. Key to Partial Budget Form.

19. VAS Slidefilm 370-A, Inventory Your Resources.

20. VAS Slidefilm 371-A, Planning the Cropping System and Estimate the Value of Crop Production.

21. VAS Slidefilm 372, Plan the Livestock System and Estimate Fertility Costs.

22. VAS Microcomputer Program in Agriculture--Livestock Budget.

    This program is designed to allow the user to evaluate the income and costs of livestock production, allowing for various options.

23. VAS Microcomputer Program in Agriculture--Fertilizer Cost.

    This program is designed to allow the user to determine the fertility requirements of a crop and the cost of meeting the crop's fertility requirements.

24. VAS Microcomputer Program in Agriculture--Crop Budget.

    This program is designed to allow the user to modify and observe the break-even price required for a crop to return a profit when input variables are changed.

25. VAS Microcomputer Program--Income Possibilities.

    This program is designed to provide an estimate of income, direct costs, and selected other costs for crops and livestock in a farm plan.

26. VAS Microcomputer Program--Machinery Decisions.

    This program is designed to assist the user in calculating:

    1. machinery field capacity.
    2. cost of owning new equipment.
    3. shared costs of machinery ownership.
    4. custom rate computations.

27. VAS Microcomputer Program--Soil Loss Equation.

    This program is designed to allow the user to develop a land-use plan that will maximize returns while maintaining an allowable soil loss.

INFORMATION SHEET

ARE YOU A GOOD MANAGER?

The functions of management are making decisions and accepting risks. A good manager usually realizes better earnings than a poor manager. To help appraise your management ability, answer the following questions.

1. Do you get your work done on time?
2. Do you keep good records?
3. Do you make sound management decisions?
4. Are you progressive--looking for new ideas and practices to adopt?
5. Do you manage your finances properly?
6. Can you manage hired labor successfully?
7. Can you handle the enterprises you plan to carry on?
8. Do you study your business, analyze and evaluate it?

INFORMATION SHEET

HOW ARE CROPS CLASSIFIED?
TYPES AND EXAMPLES

Row Crops

Corn
Soybeans

Small Grains

Oats
Wheat

Forage Crops

Bluegrass
Alfalfa

High Profit Crops

Corn
Soybeans

Low Profit Crops

Small Grain
Grass Forage Crops

Effective in Erosion Control

Grasses
Legumes
Small Grains

Soil-improving Crops

Alfalfa
Red Clover
Ladino

PLANNING GUIDE #1

INVENTORYING LAND RESOURCES*

1. Draw a map of present land use and field arrangement.
    a. Refer to Figure 2 in VAS Unit 2002b for problem form example.
    b. Use county plot book to obtain the outline of local farms.
    c. Label map to show boundary lines, fences, drainage system, roads and buildings.
2. Make a chart showing recent soil treatments.
    a. Refer to Table 1 in VAS Unit 2002b for problem form example.
    b. Record soil test information if available or attach report.
    c. Record applications of limestone and fertilizers for past 2-3 years.
3. Draw a soil-type map.
    a. Refer to problem form example shown in Figure 3, VAS Unit 2002b.
    b. Obtain a soil map on your farm from Soil Conservation Service.
    c. If a soil map is not available, draw one using the "Soil Map of Illinois" available in most schools.
    d. Completed map should show soil type, slope and erosion classes.
4. Prepare a table showing number of acres in each soil type.
5. Draw a land-use capability map.
    a. Refer to a booklet on land judging for information on how to arrive at the land classes for your farm.
    b. Refer to page 3, Planning Your Farm Business, for descriptions of land classes and color symbols.

*This outline of steps is an abbreviated version of procedures described in VAS Unit 2002b, Inventorying Resources for Farm Planning.

PLANNING GUIDE #2

PREPARING THE LABOR INVENTORY

1. Read instructions and study problem form example shown on page 7 of VAS Unit 2002b.

2. Complete the following table for a labor inventory of your farm business.

Name	Age	Available	Work	Months
Operator				
Family				
Hired Labor				

Total months of labor available ______

PLANNING GUIDE #3

INVENTORYING CAPITAL RESOURCES

1. Read instructions and study forms on pp. 7-9 of VAS Unit 2002b.

2. Study Table 4, VAS Unit 200b, which is a capital inventory table completed for the problem farm.

3. Prepare a capital inventory for your farm including the following information:

    a. Building Inventory. Use table outline shown on p. 8 of VAS Unit 2002b.

    b. Fences. List kind, amount and condition.

    c. Machinery and Equipment. List age, brand, size, condition, and owner for each machine or piece of equipment.

    d. Grain and Roughage Inventory. Use table outline shown on p. 8 of VAS Unit 2002b.

    e. Livestock Inventory. Use table outline shown on p. 9 of VAS Unit 2002b.

    f. Funds Available. Follow example shown on pp. 9 and 11 of VAS Unit 2002b.

PLANNING GUIDE #4

INVENTORYING THE AVAILABLE MANAGEMENT

1. Read instructions on p. 11 of VAS Unit 2002b.

2. Answer the following questions about the operator or manager of the farm you are using for a planning exercise:

   a. Do you have a particular preference in raising some crop or livestock enterprise?

   b. Do you have the ability to handle the enterprises you plan to carry on? You will have to develop that ability if you are to be successful.

   c. Do you manage to get your work done on time?

   d. Are you progressive--looking for and adopting new practices and ideas?

   e. Can you manage hired labor successfully?

   f. Do you make sound business decisions?

   g. Do you keep good records?

   h. Do you constantly study your farm business and keep informed on current developments?

   i. Do you practice good financial management?

   j. Do you think and plan or "trust to luck"?

PLANNING GUIDE #5

PLANNING THE LAND-USE PROGRAM AND ESTIMATING THE VALUE OF CROP PRODUCTION

1. Study VAS Units 2003b and 2006b before developing a land-use program for your farm.
2. Review field arrangement maps and planning exercises for problem farm included in VAS Unit 2003b.
3. Determine the cropping system to be followed on your farm using principles of sound land use described in VAS Unit 2003b.
4. Draw a map of your farm showing field arrangement and crop sequences to be followed as an ultimate goal.
5. Draw one or more maps showing field arrangements and crops to be grown during transition period.
6. Refer to p. 6, Planning Your Farm Business, for suggestions and instructions regarding maps.
7. Study Sections 4, 5, and 6 in VAS Unit 2006b to obtain background information on estimating the value of crop production.
8. Study tables in VAS Unit 2006b which show information on estimating the value of crop production for the problem farm.
9. Use table outlines and related information on pp. 8-10, Planning Your Farm Business, to complete estimates for your farm.
10. Prepare a summary table for your farm similar to Table 9 in VAS Unit 2006b.

PLANNING GUIDE #6

PLANNING THE LIVESTOCK PROGRAM AND ESTIMATING THE VALUE OF LIVESTOCK PRODUCTION

1. Before you begin to develop a livestock program, you should study Sections 1, 2, and 3 in VAS Unit 2012b.

2. Review the recommended livestock programs for the problem farm shown in VAS Unit 2012b and pay special attention to the reasons why certain combinations would be advantageous.

3. Develop two or more alternative livestock programs for your farm. Use format shown in Table 8, VAS Unit 2012b.

4. Summarize alternative livestock plans using format shown in Table 9, VAS Unit 2012b.

5. Refer to pp. 11 and 12 in Planning Your Farm Business for information on feed requirements for different classes of livestock.

PLANNING GUIDE #7

ESTIMATING LABOR NEEDS

1. Study VAS Unit 2035a, Balancing the Labor Supply and the Farm Business.

2. Review estimated labor needs and monthly distribution of labor for problem farm on pp. 3-5 of VAS Unit 2035a.

3. Study labor requirements for crop and livestock enterprises shown on p. 15 of Planning Your Farm Business.

4. Prepare a table similar to Table 4 in VAS Unit 2035a to show hours of labor needed on your farm for (a) crop enterprises, (b) livestock enterprises, and (c) overhead labor. Use data in Planning Your Farm Business to make these calculations.

5. Prepare a labor distribution chart similar to Table 5 in VAS Unit 2035a to show the monthly distribution of labor for crops and livestock on your farm.

6. Construct a bar chart similar to Figure 1 in VAS Unit 2035a to show how labor requirements are distributed throughout the year.

7. If labor requirements and labor supply differ appreciably, write a plan for adjusting the farm labor plan to make it work.

PLANNING GUIDE #8

ESTIMATING COSTS FOR BUILDINGS, EQUIPMENT AND FERTILITY

1. Study VAS Units 2039a and 2010b to gain background information on fertility programs and machinery and equipment costs.

2. Review information on estimating fertility, equipment, and building costs on pp. 16-25, Planning Your Farm Business.

3. Use data presented on p. 29 of Planning Your Farm Business to determine building requirements for the newly-developed crop and livestock plan for your farm.

4. Estimate costs of new buildings needed using information and format shown on pp. 23-24 of Planning Your Farm Business.

5. Estimate the costs of machinery and equipment for your farm using the format shown on p. 25 of Planning Your Farm Business.

6. Estimate fertility costs for your farm using information and tables shown on pp. 16-19 of Planning Your Farm Business.

PLANNING GUIDE #9

ESTIMATING NET EARNINGS AND MAKING CREDIT PLANS

1. The following worksheet, taken from the Key to Planning Your Farm Business, can be used to estimate earnings under the new plan to compare them with what was earned under the old plan.

Item	Present Plan	New Plan
Value of production		
1. Total value of crops (page 10) . . .	$ ________	$ ________
2. Value added by livestock (page 13)	________	________
3. Other cash farm income (A.S.C.S. payments, custom work, etc.	________	________
4. Total value of production	$ ________	$ ________
Expenses (other than feed and purchased livestock)		
5. Hired labor, _____ months at $_________ per month	$ ________	$ ________
6. Buildings and fense		
a. Depreciation and repairs (pages 21-24)	________	________
b. Annual cost of new buildings to be added (pages 21-24)	XXXX	________
7. Machinery and equipment--depreciation; repairs; custom work hired; fuel and oil; farm share of auto, telephone, and electricity (pages 21-22)	________	________
8. Taxes (operator's property taxes on farm business items or January 1 total farm investment times 1.0%) . .	________	________
9. Seed and crop expense (page 21) . .	________	________
10. Fertilizer (pages 17-19)	________	________

Item	Present Plan	New Plan
11. Livestock and miscellaneous expenses (pages 21-22)	________	________
12. Cash rent	________	________
13. Total	$ ________	$ ________
Earnings		
14. Total value of production* (line 4)	$ ________	$ ________
15. Total expenses (other than feed and purchased livestock (line 13) . .	________	________
16. Net Farm Income--operator's share** (line 14 minus line 15)	$ ________	$ ________

*The total value of production as used here does not include the value of purchased feed and livestock, since these expenses were taken out on pages 12 and 13.

**This measure corresponds to returns to unpaid labor, capital, and management.

2. Refer to pp. 30-31 of Planning Your Farm Business for assistance in estimating credit needs and developing credit plans for the proposed farm plan. You will need to work out annual budgets for a period of years to estimate credit needs.

PROBLEM ILLUSTRATION FOR PLANNING YOUR FARM BUSINESS

This problem can be used for practice in filling in the booklet to estimate various cost and return items, including as a final figure the estimated Net Farm Income under the new plan.

The information provided assumes that the inventory of resources has been completed. It also assumes that crop acreages, yield estimates, and the kinds and amounts of livestock have been tentatively planned.

The Illustration or Key for this problem does not show calculations for alternative systems. After you complete the problem, you may want to change the crops or livestock, or both, and try to obtain a higher income (Part B).

A. Follow the suggested procedure throughout the booklet to find the estimated Net Farm Income for an operator who owns most of his land but pays cash rent on part of it. He farms 400 acres and has made tentative plans for:

Crops: 220 acres of corn; expected yield, 125 bushels @ $2.40 per bushel
115 acres of soybeans; expected yield, 40 bushels @ $6 per bushel
40 acres of wheat; expected yield, 55 bushels @ $3.25 per bushel
20 acres of alfalfa hay; expected yield, 5.5 tons per acre
(5 acres are taken up by the farmstead.)

Livestock: 100 steer calves; 60 bu. corn, 1.1 tons hay equivalent, 300 pounds supplement, and 10 hours of labor per head.
(Buy at 450 pounds @ $75 per cwt.; sell at 1,050 pounds @ $70 per cwt.)

50 sows (two litters each in 4-litter system); 15 hours labor per litter; no pasture.
(Sales of 1,600 pounds per litter @ $55 per cwt.)
(Average price of protein supplement for steers is $.135 and for hogs, $.1625 per pound.)

Labor: 23 months available, averaging 220 hours per month; 12 months of it to be hired at $1,200 per month; overhead labor, 950 hours.

Fertility costs: Use pages 16-18 to estimate these costs. (Corn, 150 lb. N; 90 lb. P_2O_5; 90 lb. K_2O. Wheat, 40 lb. N; 90 lb. P_2O_5; 90 lb. K_2O.) Make adjustments for manure added by livestock through the corn fed and nitrogren in the alfalfa. Figure $.21 per lb. of N, $.30 per pound of P_2O_5, and $.15 per pound of K_2O. Figure $4.50 per tillable acre for limestone maintenance.

Present building costs: Similar to table on page 21. Use $5,800.

New buildings to be added: Use pages 23 and 24; figure $200 per steer for new feeding barn and facilities, $1,600 per pen for a 24-pen farrowing house, and $110 per pig times half of the pigs (800 pigs per year) for a new finishing building.

Machinery and equipment: From table on page 21, $30,100; add $54 per litter and $12 per steer to take page 22 information into account.

Taxes: $4,800

Seed and crop expense: From table on page 21, $18,500.

Livestock and miscellaneous: From page 21, $3,540; add $41 per litter and $10 per steer.

Cash rent: 160 acres cash rented @ $110 per acre.

B. Budget alternative organizations for the same 400 acres to see if you can increase the Net Farm Income. Place a limit on capital of $105,000 to be spent for new buildings and equipment.

KEY DECISION MAKING STEPS

Define problem

Get ideas, facts---observe situation

Analyze possible alternative solutions

Decide/select best solution

Act on decision

Accept responsibility for results

STEPS IN FARM PLANNING

1. Inventory the farm resources
2. Plan the land-use program
3. Estimate the value of crop production
4. Plan the livestock program
5. Estimate the value of livestock production
6. Estimate labor needs
7. Estimate the costs for buildings, equipment, and fertility
8. Estimate net earnings
9. Plan to meet credit needs

RESOURCES USED IN FARM PRODUCTION

1. LAND

2. LABOR - PHYSICAL EFFORT
   a. Operator's labor
   b. Family labor
   c. Hired labor

3. CAPITAL
   a. Farm improvements
   b. Machinery and equipment
   c. Livestock
   d. Supplies

4. MANAGEMENT

TEACHER'S KEY

SAMPLE TEST QUESTIONS

PLANNING AN AGRICULTURAL PRODUCTION BUSINESS

TRUE (+) or FALSE (0)

_0_ 1. Fixed costs on machinery vary with the use of the machine.

_+_ 2. The best plan for a particular farm can be prepared only in relation to the resources on that farm.

_0_ 3. The best farm plan is one that provides the farmer with the highest gross return.

_0_ 4. Sound land use refers to the use of the land to provide the farmer with the greatest profit or benefit.

_+_ 5. Land in Classes V, VI, VII, and VIII should not be cropped.

_0_ 6. Large fields require more fence per acre than small fields.

_+_ 7. The amount of soil erosion is usually greater during the period May 1 - October 1 than it is during the rest of the year.

_0_ 8. Small grains require more labor per acre than row crops.

_0_ 9. Beef cattle herds require more labor per unit than dairy herds.

_+_ 10. Alfalfa is a deep-rooted crop.

_+_ 11. Grass forage crops inhibit erosion.

_0_ 12. Small grains are heavier feeders of soil nutriens than row crops.

_+_ 13. You should equip the farm with basic power units and tillage equipment before purchasing specialized harvesting equipment.

_0_ 14. Personal preference should be the main consideration in deciding whether or not to buy a machine.

_0_ 15. Doing custom work enables a farmer to reduce the annual fixed cost of a machine.

COMPLETION (Write the appropriate word or words in the blanks provided.

1. The first step in planning a farm business is to inventory resources presently used.
2. A field of subject matter and study which involves the problems of organizing the resources of an individual farm and carrying out farm operations to maximize returns is called farm management.
3. A farm plan cannot be properly evaluated unless the operator keeps a good set of farm records.
4. Two important ways of increasing farm earnings are to increase the size of the farm business or to increase the efficiency of operations.
5. A class of livestock which requires a 100% concentrate ration is poultry.
6. Complete use of farm resources can be achieved by the addition of livestock to the farm enterprise.
7. Enterprises which use the same resource at the same time are called competing enterprises.
8. Enterprises which contribute something or make it possible to increase production from another enterprise is called a complementary enterprise.
9. Average annual rainfall in Illinois ranges from 48 inches in the south to 32 inches in the north.
10. In general, as one moves from the south to north in Illinois, soils become darker in color, length of growing season decreases, and average annual rainfall decreases.
11. Growing more than one crop on a field in one season is called double cropping.
12. To help decide how much mechanization should be used to replace labor, the principle of resource substitution could be used.
13. A cost which remains the same regardless of how much a machine is used is called a fixed cost.
14. The principle of diminishing returns tells us that the product resulting from each additional unit of a variable resource will decline as we add more and more units.

MULTIPLE CHOICE (Make appropriate choice of A, B, C, or D)

_C_ 1. An example of operating costs for a tractor is

a. depreciation.
b. insurance.
c. fuel.
d. taxes.

_B_ 2. Which of the following crops is the highest profit crop in most sections of Illinois?

a. oats
b. corn
c. wheat

_D_ 3. A square forty-acre field requires

a. 400 rods of fence.
b. 160 rods of fence.
c. 240 rods of fence.
d 320 rods of fence.

_A_ 4. A rectangular, 40 acre field which measures 160 rods by 40 rods requires

a. 400 rods of fence.
b. 160 rods of fence.
c. 240 rods of fence.
d. 320 rods of fence.

_C_ 5. An example of intensifying livestock production is:

a. switch from one enterprise to another.
b. produce fewer head of livestock.
c. increase volume of livestock raised.
d. automate the feeding system.

_C_ 6. Which of the following sequences is not recommended?

a. Forage crops follow small grains.
b. Small grains follow row crops.
c. Soybeans follow alfalfa or ladino.

SHORT ANSWER

1. Four resources used in a farm business are:

   a. Land

   b. Labor

   c. Capital

   d. Management

2. Three types of labor used on most farms are:

   a. Operator's labor

   b. Family labor

   c. Hired labor

3. Rearrange the following steps in farm planning in proper sequence or order they should be carried out (planning the livestock system, rearranging the farmstead, planning the cropping system, inventorying resources).

   a. Inventorying resources

   b. Planning the cropping system

   c. Planning the livestock system

   d. Rearranging the farmstead

4. The size of a farm business can be measured in terms of the following:

   a. Inputs

   b. Returns

   c. Production

5. Five ways to increase the size of a farm business are:

   a. Increase the acreage

   b. Intensify crop production

   c. Intensify livestock production

   d. Do custom work

   e. Carry out additional marketing processes

6. Rank small grains, forage crops, and row crops in the order that they are effective in erosion control:

   a. Forage crops

   b. Small grains

   c. Row crops

7. What do the following letters stand for in the universal soil loss equation?

   A Average soil loss in tons per acre per year

   R Rainfall factor

   K Soil erodability factor

   LS Factor for length and steepness of slope

   P Erosion control practice factor

   C Cropping and management factor

8. What are three advantages of growing more than one crop?

   a. Reduces risk

   b. Distributes labor needs

   c. Distributes machinery needs

9. What factors affect crop yields?

   a. Soils and climate

   b. Use of fertilizers

   c. Varieties of crops

   d. Insects and diseases

   e. Weed control

   f. Tillage systems

   g. Other cultural practices

   h. Row width

   i. Rate of seeding

10. Four costs which are classified as "fixed" costs are:

a. Depreciation

b. Interest

c. Insurance

d. Taxes